Telephony.
THE AMERICAN TELEPHONE JOURNAL
Comprising Telephony, American Telephone Journal, Telephone Weekly, Telephone Magazine, Telephone Securities, The Telephone Sound Waves
PUBLISHED WEEKLY BY TELEPHONY PUBLISHING CORP.
608 S. Dearborn St., CHICAGO

H. D. FARGO, PRESIDENT AND TREASURER
S. R. EDWARDS, EDITOR AND SECRETARY
H. D. FARGO, JR., VICE-PRESIDENT AND ADVERTISING MANAGER
D. C. SORENSEN, WESTERN ADVERTISING MANAGER

Entered as second-class matter September 4, 1908, at the postoffice at Chicago, Ill., under act of March 3, 1879.

Volume 98
Number 23
CHICAGO, SATURDAY, JUNE 7, 1930
Subscription — 10 Cents a Copy
$3 a Year U. S., Cuba and Mexico
$4 Canada, $5 Other Countries

THE TELEPHONE FIELD'S COMMENTS ON DEVELOPMENT STATISTICS

Telephone statistics are always interesting and usually lead to useful comment from men active in the business. The publication of figures relating to telephone development in cities, in the May 10 issue of TELEPHONY, apparently stimulated thought on the subject, as a number of letters have been received from the field in which new angles are presented.

The idea that the greatest telephone density found in the large cities signifies the largest per capita use of the telephone is not accepted by telephone men in the smaller communities. They say—and with reason—that the huge city hotels, with a telephone in each of their thousands of rooms, and the large number of stations in the private systems of the large industrial concerns, give the cities an advantage that distorts the picture of comparisons.

In other words, 100 telephones in 100 individual homes in a middle-size town mean more in actual telephone development than 100 telephones in 100 guest rooms in a big hotel in Chicago or New York. There is no denying the force of this statement.

* * * *

D. E. McGregor, president of the Nebraska Central Telephone Co., with headquarters at Gibbon, Neb., has been studying telephone statistics in the preparation of an advertising program which his company directors have decided to carry on this year. In a recent letter, he says:

"I was very much interested in your editorial in a recent issue of TELEPHONY, giving the telephone development of the larger cities and the different countries. You spoke about the development in foreign countries being confined to the larger cities, which gives the United States the advantage in the total number of telephones, but I do not think the picture is complete unless it is shown that here in the United States the telephone is in practically universal use, everywhere, both for social and commercial purposes; that here in the central states, especially, we are hardly ever farther from a telephone than the nearest house, whether in town, country or city.

Here in our own little town of 824 people, we have 258 telephones which gives a development of 313 per 1000; and I know there are thousands of other small towns in the central states with as good a showing, while in the larger cities the commercial and hotel use of the telephone distorts the percentage of development by the actual residents of the community in question.

The point that I am driving at is: the *per capita use* of the telephone is really much greater in the small cities and towns, even though the *per capita development* is higher in the larger cities; and I am sure a census by families would prove this out.

Telephone service is so universal here in this section that we take it for granted nearly as much as the air we breathe, and we never stop to think that there are parts of our own country where a family having a telephone is as rare as one having an airplane in our own neighborhood.

Few of us ever stop to think that we can step to the telephone and, within a few minutes, either be talking to, or have a report on where we can locate practically every other person in the United States, as well as several foreign countries. So why should people in other countries not be able to realize that there is a telephone within reach of practically everyone in the United States?"

* * * *

Ralph W. Neeb, commercial supervisor of the Home Telephone & Telegraph Co., of Fort Wayne, Ind., writes that the 1930 census gives that city 115,000 population, and as his company operates 33,206 telephones, Fort Wayne has a development of 288 telephones per thousand people. This places Fort Wayne close to Chicago, the third ranking city which has 290. The general statistics show that for the larger cities of the United States the average ratio is 218 telephones per thousand.

Mr. McGregor's company, with a ratio of 313 per thousand, is materially ahead of the average large city's 218 as well, and still farther ahead of the smaller town average of 126.

* * * *

Another interesting letter comes from the British Columbia Telephone Co., which makes the claim that Vancouver is entitled to second place among the cities of the world in telephone development, and not Stockholm, Sweden, which was so ranked in the official figures.

E. F. Helliwell, general commercial superintendent, says the British Columbia company was operating 58,692 telephones in its "base rate area" on January 1, and that the population was 182,793, making 321.08 telephones per thousand people.

"We believe," says he, "that these figures show that Vancouver, and not Stockholm, takes second place among the cities of the world in telephone development."

In another statistical table, labeled "city area," Mr. Helliwell reports 69,443 telephones operated by the British Columbia company in a territory having a population of 240,421. This means 288.84 telephones per thousand, which closely approximates the Fort Wayne figures. San Francisco, it will be recalled, led all the cities of the world with 336 telephones per thousand.

Service the Main Issue.

In all the agitation about utility rates the common-sense viewpoint that good service is even more important to the public is receiving increasing attention. This will eventually be helpful to companies furnishing the service.

Broad-minded men are realizing more and more that the main thing is to insure the people adequate utility service. Nine times out of ten the rate is a secondary consideration. If the service is unsatisfactory and unreliable, it doesn't make much difference how low the rate is—nobody is contented.

Julius H. Barnes, chairman of the National Business Survey Conference, had this thought in mind when in an address before the American Newspaper Publishers' Association, he said:

"In public regulation of utilities there is general evidence that the public authorities will appreciate that relative energy in extending such facilities is far more important in the public interest than repressive control of rates alone.

Railroads, power service, telephone communications, should all in the public interest be so fairly treated that they may have sufficient reserve to conduct research, to welcome new invention and equipment, to scrap out-dated appliances. They should be in a position to re-equip and expand for the benefit of those they serve. New industry and expanded old industry with growing payrolls are more important than a rigid limitation of earnings."

* * * *

Members of state regulatory commissions, generally speaking, recognize the soundness of this business-like theory, and are growing less and less inclined to quibble over rates if the service is satisfactory. It is usually the politicians and the sensation-seeking newspapers that overlook this phase of the question and start a hue-and-cry that magnifies the rate issue and shoves the service angle into the background. Unless they are excited by the misrepresentations of such demagogues, the majority of people are more interested in service than rates, and are willing to give the utility company fair compensation.

COMING CONVENTIONS

Independent Telephone Association of Washington, Hood River, Ore., June 10 and 11.

Telephone Association of Vermont, Hotel Van Ness, Burlington, June 26 and 27.

Illinois Telephone Association, Pere Marquette Hotel, Peoria, November 12 and 13.

Outside Telephone Plant Engineering

Discussion of Various Matters Concerning Telephone Plant in Which the Plant Engineer Is Interested in Order to Provide Facilities for Serving Subscribers—Factors in the Economical Design of Plant—Cost Analyses

By Otto K. Henry,

Plant Engineer, Citizens' Independent Telephone Co., Terre Haute, Ind.

It has only been within comparatively recent years that telephone engineering came into existence. Our first telephone properties were built and operated with little or no engineering whatever; but the rapid progress of the art and the development of the business, particularly in the large metropolitan centers, soon made evident the need for careful planning. Thus was brought about the development of plant engineering, to forecast future development and provide facility requirements.

Telephone engineering may be considered as a study and prediction of the demand for telephone service, and the study and the planning of the plant, its use and upkeep, and the operation required to meet that anticipated demand. Broadly speaking, it may be divided into three divisions: (a) Commercial engineering, (b) equipment engineering, and (c) outside plant engineering. In this article we shall deal only with the latter subject, outside plant engineering.

Outside plant engineering may be defined as the study and the planning of the construction, use, upkeep and extension of outside plant, to effect economical operation of the property. The plant engineer, in preparing detail plans and compiling estimates for construction, must of necessity give careful consideration to construction problems. It stands, therefore, that he must necessarily be a good construction man. Hence most of the larger telephone companies subject their engineering recruits to an extensive training in the construction department, or select them from that department.

Virgin telephone territory is practically unknown today, and since practically all communities have some kind of telephone facilities, the plant engineer is concerned with the following:

(a) The preparation and maintenance of plant records.

(b) The study and supervision of the use of the outside plant, so as to maintain its proper operating efficiency, the assignment of conductors and the rearrangement of facilities to meet development changes.

(c) An understanding of the physical condition of the outside plant, in order that replacements and repairs may be anticipated and provided for, as may be necessary to insure stable service.

(d) An understanding of the capacity of the outside plant and the unused facilities, so that additional facilities may be provided to meet service demands.

(e) The study and knowledge of the growth of the population, and the trend of residential and commercial development in the community being served, so that extensions and additions to the plant may be made as additional service demands require.

(f) Cooperation with other wire-using companies, as to joint-pole use in the territories served and the elimination of unsatisfactory working and maintenance conditions.

(g) The study and development of economic plans for outside plant extensions, additions and rearrangements.

(h) The understanding of construction practices, specifications, right-of-way conditions and company routines.

(i) The preparations of plans and the compiling of estimates for construction,

reconstruction, extension and rearrangement.

(j) A knowledge of completed and uncompleted work, so as to know what plans have or have not been properly completed, and to be in possession of the reasons for any difference in the estimated and actual costs of the completed work.

One of the chief responsibilities with which the plant engineer is entrusted is the maintenance of a high working efficiency of plant. This requires constant attention and supervision on his part, and the close cooperation of the other departments. The control of efficient plant requires, aside from economical and careful design of the original plant, (a) the assignment of conductors, and (b) temporary relief measures.

The assignment of conductors for the completion of service orders is of much more importance than is generally recognized. Proper and improper assignment of conductors may easily make the difference between unnecessary congestion, expensive installations, early relief measures and reassociations on the one hand; and the efficient and economical operation of the facilities at hand on the other.

One of the important factors in the economical use of plant, where the party-line development is high, is station and line association. The best association, of course, is that in which the greatest number of stations is served through the least number of lines. Traffic regulations, directory changes, etc., prevent the maintaining of an ideal association for any considerable length of time. An occasional check should be made to determine the ratio of association and steps taken to increase the ratio, should it be found low and approaching congestion warrant a reassociation.

No matter how carefully and efficiently a plant may be engineered, there always comes a time when, due to unforeseen developments, temporary relief measures are necessary. These relief measures usually consist of: (a) rearrangement of multiples, (b) installation of cross-connection boxes, and (c) restriction of service.

Temporary relief measures should be considered only when they are more economical than permanent work, or when it is not practicable to perform the permanent work within a reasonable time.

Rearrangement of cable multiples should not be resorted to generally, unless the new arrangement will be permanent. The handling and resplicing of pairs may weaken the cable and increase the number of defective pairs. Improper design of cable multiple, or an unanticipated development, may result in improper multiple with unused conductors unavailable where required. Under such conditions, the rearrangement of the multiple may be warranted.

It is sometimes advisable to resort to the installation of cross-connecting boxes in the feeder cables to redistribute working pairs. This is, however, an expensive method and should be carefully considered from an economical standpoint before final decision is made.

Restriction of service should never be resorted to except in cases of compulsion, and should rarely be necessary if proper attention has been given to efficient operation of the plant.

Since the plant engineer is charged with the responsibility of providing facilities, those service orders which cannot be completed with the ordinary amount of work are referred to him. Delayed service orders, therefore, are a result of a lack of facilities necessary to provide the service ordered. When unused facilities are available, service orders may be completed without delay in their regular routine.

Delayed service orders may be completed by one of the following methods:

(a) By a checking of cable pairs to be sure that no pairs are available in the required terminal.

(b) By transferring working pairs from the congested terminal, or a multiple of it, so as to clear a pair in the terminal desired.

(c) By installing an additional terminal at a location that will relieve the congested terminal or allow the making of transfers.

(d) By the reassociation of party-line stations to clear a pair in the congested terminal.

(e) By clearing trouble on defective pairs, when not too expensive.

(f) By the insertion of cross-connection boxes in feeder cables.

In locations where no facilities exist by:

(g) Arranging to use the poles of other wire-using companies.

(h) Small plant extensions.

(i) Large plant extensions requiring a study of the best and most suitable plans for relief.

Requests for service outside the exchange limits, where facilities do not exist, should be covered by a facility request made in writing to the plant engineer for an estimate of probable cost of plant to furnish the service desired. These requests should definitely locate the prospective subscriber, stating the kind and class of service petitioned for.

The engineer will then, through investigation, decide upon the logical route of the required extension, and furnish a preliminary estimate of the type, amount and cost of the construction required to provide the service. The commercial department shall then be furnished with all pertinent facts, with which to determine when and under what conditions service shall be provided.

Ordinary repairs of plant, so as to keep it in serviceable condition, are normally a continuous expense taken from the current earnings of the company, and are a part of the operation costs. The plant engineer should, therefore, know at all times the cost of repairs for each kind of plant in his territory. Through a study of these facts the plant engineer is able to determine the most economical balance between operating expense and capital investment.

Extraordinary repairs consist of those repairs necessary to restore plants damaged or destroyed by casualties, such as fire, flood and storms. The plant engineer should, insofar as possible, minimize the possibilities of these casualties by proper design, maintenance and protection of plant. Requests or recommendations calling attention to defective, broken or undesirable conditions of plant should be made on suitable forms by those employes finding such conditions. These requests should contain all necessary information to enable the plant engineer to make investigation and determine what action to take to relieve the situation.

In all cases, before extensions are considered, existing facilities must be carefully considered before determining what relief work, if any, should be undertaken. The greatest need of this knowledge will be found in the cable plant. The working efficiency of this part of the plant should be determined with respect to each

"Truisms" in Business

By W. M. Boyd

Vice-President and Treasurer, United Telephone Co., Cleveland, Ohio

Some people are so selfish that they not only live their own lives, but they try, also, to live the lives of those about them.

The best "Pat on the Back" is an "increase" in the "Pay Envelope."

You can never afford needlessly to antagonize any one. Drop the "needlessly" and you have a still better rule.

Try to win the arguments that involve a principle or money. Gracefully lose the others and make friends. Another way of saying the same thing: Give in on the small points and you may expect help on the larger ones. Courtesy, you know.

A man may be a fool, but you gain nothing by telling him so; the information won't improve him. If you must say something, talk about the weather.

Unsolicited advice is seldom appreciated. If the advice is followed and is wrong, you bear the blame; if right, the receiver usually takes credit for brilliant forethought.

Better to say that a man is seldom right than to say that he is always wrong.

It is easy to guess the winner after the race has been run. In the jargon of the street, this might be termed "second guessing."

cable or group of cables in a route before determining the amount of relief required. Each cable of a group of cables may be easily and quickly classified as congested, nearing congestion, satisfactory or low by following a definite plan of checking.

When outside plant is nearing congestion, the following three methods of relief may be considered:

(a) Building additional new plant along another route and throwing some of the load to the new plant.

(b) Building additional new plant along the present route and throwing some of the load to the new plant.

(c) Building new and larger plant to replace the present plant.

Practically all types of plant will permit a choice between the first plan and the second and third plans, the method used being more dependent upon local conditions than difference in cost. A choice between the second and third plans is practicable for cable plant only, as other kinds of plant construction do not fit in with both methods.

Careful consideration should be given to these points which may affect the type of plant to be used: (a) Practicability from a construction standpoint; (b) inductive disturbance; (c) desirability from commercial and traffic standpoints, and (d) municipal, state or federal regulation.

If a choice is still undetermined, the decision should rest with economic selection. The reason for any plant extension or addition may include right of way and operating conditions, which may affect the choice of type and size of plant. For this reason careful consideration should be given to all contributing factors of each problem before attempting to make an economical or theoretical selection of type and design of plant.

Another item to receive careful consideration is the maximum fill of that portion of the plant to be extended. By maximum fill we mean that per cent of the total capacity of the unit of plant which can be used without danger of affecting the continuity of service before relief is provided.

A cable may have 100 pairs, but the maximum fill of this cable will not be 100 per cent. No matter how carefully a cable may be manufactured, or how rigid the construction specifications may be, some pair failures are almost sure to be experienced.

No telephone engineer can prognosticate future developments so proficiently as to make his plans absolutely accurate. Telephone growth frequently changes, and that may seriously affect the number of lines needed. For safety reasons, new cable should rarely exceed 60 per cent fill. The maximum fill, however, may be considerably higher, the percentage depending somewhat upon local conditions.

It is quite necessary that the plant engineer keep himself well informed regarding extensive growth and spare facilities, so that plans for relief of plant nearing congestion may be prepared well in advance of the time it is actually required, to allow for financing and constructing.

As nearly all plans for relief or extension of plant require constructing or rearranging of the existing plant, whenever both practicable and economical, reuse of old material should be made. Old material, when in good condition, may be used for temporary work. It should be used for permanent work only when the remaining life is sufficient to show economy over the use of new material.

An economical design of plant will require the careful consideration of several plans providing for immediate requirements and future growth. The relative economy of the several plans should be carefully studied. These studies and comparisons present a very real basis for deciding many features of outside plant. When properly considered, they constitute what is commonly known as economic selection. However, before the final design of plan is definitely decided upon and the work of executing the detail plans begun, the plant engineer should satisfy himself and be ready to show proof of the following:

(a) That it should be done at all.

(b) That it should be done now.

(c) That it should be done as recommended.

Economic selection is choice based on long-time, least cost. In other words, it is selecting the type and kind of plant that will cost least in construction, operation and maintenance during a period of time, usually ten years.

For example, everyone knows that a cedar shingle roof costs little when compared with the first cost of a slate roof, but that it requires after a few years constant repairs and frequent renewals, while the slate roof requires little or no attention and lasts indefinitely. From this we naturally conclude that the slate roof is the least expensive of the two in the end.

This is economic selection, but the example is so simple that an analysis of the cost of construction, operation and maintenance was not necessary.

A study of the cost of constructing, operating and maintaining existing or proposed plant is the basis of economic selection. Since serious errors may result from improper methods, it is important that the engineer understand fully the best way to prepare them. For convenience, the cost over any period of time of owning and operating a property is usuallly divided into two parts: (a) Fixed costs, and (b) variable costs.

Variable costs are operating expenses, and are dependent upon the amount and kind of service rendered. In problems concerning telephone plant construction, these variable costs seldom require consideration, since with the exception of maintenance, they are usually the same for each kind of plant.

The plant engineer is, therefore, more concerned with fixed costs. Fixed costs are those costs that are in proportion to the cost of plant and are sometimes called annual charges. They include interest, taxes, insurance, depreciation and administration.

Interest represents the cost of money and is the net return which the money invested must yield if the business is to remain in a substantial condition. Taxes are based on the value of the property and upon the amount of stock or other securities issued. Insurance is the premium paid for protection from loss by flood, fire or other casualties and are based upon physical valuation.

Depreciation is that proportion of the first cost which must be set aside each year as compensation for deterioration, obsolescence and inadequacy. Administration or general supervision includes that part of the salaries and expenses of the general office which is chargeable to the fixed investment.

In preparing an analysis of the cost of furnishing service, or of determining which of two or more plans will prove most economical, we naturally follow three general steps:

(1) Collecting data concerning the service required and the extent and duration of immediate and probable future requirements, as well as any other factors which may affect the demand for service or the probable cost of furnishing that service.

(2) Development of plans for plant changes or extensions necessary to meet these service requirements.

(3) The selection on a basis of comparison and determining on this basis the cost of furnishing service after the construction has been completed.

The collection of data naturally falls into two classes—development study and new money required.

In development studies we are concerned in: (a) The commercial character of the area in question; (b) present and probable future population; (c) population and telephone ratio; (d) future telephone development, and (e) probable number of telephone lines required and many other items, which may affect the probable future demands for service.

When considering new money required, we must naturally give attention to: (a) The cost of the feeder plant; (b) the cost of the distributing plant; (c) the cost of additional central office equipment; (d) the cost of additional operating force; (e) annual charges on company-owned buildings, and (f) rental on buildings not company owned, and any other probable cost of furnishing the service.

In the development of plans for plant changes and extensions, various ways of supplying the service will suggest them-

Table Listing Factors to Be Considered when Determining New Plant for Telephone Company for Changes and Extensions in Supplying Service.

selves. Each plan suggesting itself will present merit, but only one or two can be superior. Therefore, to enable ourselves to select the most feasible and economical plan, this is recommended: Make a preliminary investigation of all conditions affecting the proposed construction.

In making these investigations, these points should receive attention:

(a) Different routes and their right of way conditions.

(b) Joint construction with other wire-using companies.

(c) Existing or probable maintenance costs.

(d) Possibility of inductive disturbances from high-tension lines.

(e) The elimination of unsightly or non-standard construction.

(f) The method to be followed in providing future relief for growth or congestion.

(g) Probable future municipal requirements or improvements.

(h) The maximum use of present plant facilities.

By careful consideration of these items two or probably three plans will suggest themselves as best suited for the particular requirements. Having selected those plans which most nearly meet these needs, carefully prepare, purely for comparative purposes, estimates, as accurately as the occasion demands, of all construction costs in each of the accepted plans. Now list separately all data which may affect the cost of the proposed construction and the cost of furnishing the service after the construction has been completed.

The third and last step is the basis of comparison, and the selection, on this basis, of the cost of each plan. This is sometimes called interpretation of cost studies.

A point to be emphasized in cost studies and comparisons of two or more plans is: That the answer to the cost comparison is not the answer to the problem, unless all pertinent factors have been reflected and evaluated in the study. It is also well to call attention to the fact that the most economical construction plan is not necessarily the plan that will be accepted.

Other factors, which carry much weight and which cannot be given a monetary value, may affect the final decision. Among these factors are: (a) Quality and dependability of service, (b) subscriber number changes, (c) difficult construction, (d) municipal requirements, (e) operating and maintenance costs, (f) probable future changes and extensions, (g) probable changes in grade of service, (h) future labor and material costs, etc.

When giving consideration to costs, we must pay particular attention to: (a) Amount of immediate financing, (b) anticipated increase in revenue, (c) immediate and future economy, (d) effect under each plan in failure to realize the expected growth, and (e) which plan is most likely to be affected by the contingencies listed.

If a proper consideration is given to each step in the study of each plan, as suggested, it will not be a difficult matter to determine which of several plans will be the most acceptable for the local condition. For convenience a reference to Fig. 1 will make each step in this important procedure more understandable.

The proper interpretation of cost studies and comparisons require the exercise of good business judgment. Over-all consideration of many phases of a specific problem may clearly indicate which of the plans considered should be adopted. But the question may still remain—should it be done at all?

In other words, does the plan recom-

(*Please turn to page* 36.)

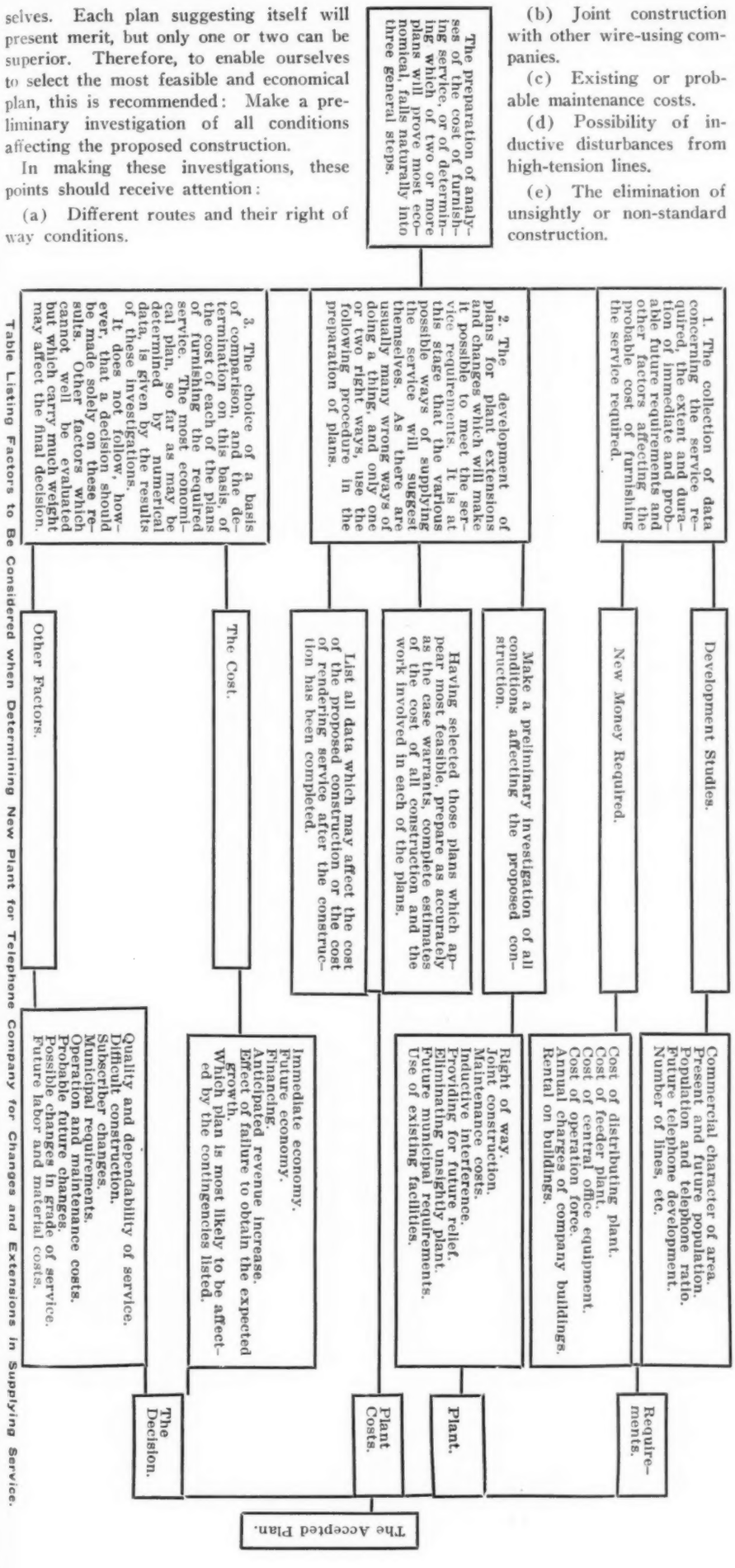

The preparation of analyses of the cost of furnishing service, or of determining which of two or more plans will prove most economical, falls naturally into three general steps.
1. The collection of data concerning the service required, the extent and duration of immediate and probable future requirements and other factors affecting the probable cost of furnishing the service required.
2. The development of plans for plant extensions and changes which will make it possible to meet the service requirements. It is at this stage that the various possible ways of supplying the service will suggest themselves. As there are usually many wrong ways of doing a thing, and only one or two right ways, use the following procedure in the preparation of plans.
3. The choice of a basis of comparison, and the determination on this basis, of the cost of each of the plans of furnishing the required service. The most economical plan, so far as may be determined by numerical data, is given by the results of these investigations.
It does not follow, however, that a decision should be made solely on these results. Other factors which cannot well be evaluated but which carry much weight may affect the final decision.
Development Studies.
New Money Required.
Make a preliminary investigation of all conditions affecting the proposed construction.
Having selected those plans which appear most feasible, prepare as accurately as the case warrants, complete estimates of the cost of all construction and the work involved in each of the plans.
List all data which may affect the cost of the proposed construction or the cost of rendering service after the construction has been completed.
The Cost.
Other Factors.
Commercial character of area.
Present and future population.
Population and telephone ratio.
Future telephone development.
Number of lines, etc.
Cost of distributing plant.
Cost of feeder plant.
Cost of central office equipment.
Cost of operation force.
Annual charges of company buildings.
Rental on buildings.
Right of way.
Joint construction.
Maintenance costs.
Inductive interference.
Providing for future relief.
Eliminating unsightly plant.
Future municipal requirements.
Use of existing facilities.
Immediate economy.
Future economy.
Financing.
Anticipated revenue increase.
Effect of failure to obtain the expected growth.
Which plan is most likely to be affected by the contingencies listed.
Quality and dependability of service.
Difficult construction.
Subscriber changes.
Municipal requirements.
Operation and maintenance costs.
Probable future changes.
Possible changes in grade of service.
Future labor and material costs.
Requirements.
Plant.
Plant Costs.
The Decision.
The Accepted Plan.

Table Listing Factors to Be Considered when Determining New Plant for Telephone Company for Changes and Extensions in Supplying Service.

Telephony and the Vibrations of Sound

Here Is Presented Part III from the Chapters on Sound in the Forthcoming New Volume, "Telephone Theory and Practice," Parts of Which Are Being Given Advance Publication in "Telephony"—Discussion of Complex Periodic Waves

By Kempster B. Miller

So far we have considered the simplest manner in which a body may vibrate. Such simple vibrations, however, are rarely found alone in nature. As a rule the vibrations are far more complex for the reason that bodies usually vibrate not only as a whole, but also in their various parts. For this or other causes, smaller ripples of different sizes are usually superposed on the main wave. The resulting wave form is correspondingly altered.

Complex Periodic Vibration.

Fourier's theorem tells us, in effect, that any periodic curve, no matter how complex may be built up by compounding a number of simple harmonic curves properly chosen with respect to their amplitudes, periods and phases. Conversely, any complex periodic curve may be resolved into either a definite number or, in some cases, an infinite number of simple harmonic curves of definite periods, amplitudes and phases.

It is also a part of Fourier's theorem that the periods of all the simple harmonic curves must be exactly commensurate; that is, they must all be exact divisors of the fundamental period. This theorem is true not only of the curves themselves, but also of the motion or any other phenomenon which the curves may represent.

Since the period is always the reciprocal of the frequency, it follows that every complex periodic vibration may be definitely resolved into a number of simple harmonic vibrations. The least rapid of these has what we call "fundamental" frequency, and all of the others have frequencies that are exact multiples thereof, no fractional multiples existing.

We may gain a more exact conception of the nature of such complex periodic vibration by considering the diagram of Fig. 34. Here, as in Fig. 33, the point, p, revolving uniformly in the large circle, is projected, as by a shadow, on to the vertical diameter of that circle. The projected point, P, then oscillates along this diameter with simple harmonic motion. This motion, since it has the lowest frequency of the series to be considered, constitutes the *fundamental* wave motion of the series.

The point, p, on the large circle forms the center of another circle around which the point, q, moves with uniform velocity with just half the period and twice the frequency of that of the first point, p. Considered alone the projection of this point, q, will move up and down the vertical diameter of its own circle with simple harmonic motion. This constitutes the second wave motion of the series; and since it has a frequency just twice that of the fundamental wave (the first multiple) it is called the *first harmonic* of the fundamental wave.

Now the whole circle in which q revolves is at the same time moving bodily around the large circle which forms the path of p. Therefore, while the projection of q is moving up and down, due to its motion in its own orbit, it is also partaking of the up and down motion of p in its larger orbit. Obviously, therefore, the motion of Q, the projection of q on the vertical line AB, will be a combination of the two harmonic motions, the fundamental and its first harmonic.

To go a step farther, the point r revolves in an orbit of its own about the center q with a period one-third and a frequency three times that of the point p. The projection of r on the vertical diameter of its own orbit will thus constitute the third wave motion of the series. Since it has just three times the frequency of the fundamental it is called the *second harmonic* of the fundamental wave.

As the center of the orbit of r is also partaking of the movements of the other two points, p and q, it is clear that its projection R on the vertical line AB will move with a complex periodic wave motion which is the resultant of three component simple harmonic motions whose respective frequencies are as one, two and three, and whose amplitudes are the radii of the respective circles in which the three points move.

In Fig. 34, the three revolving points are shown as starting in the same phase: in the full-line circles each is on the common horizontal axis. Let us consider what takes place as the movements progress. At the instant when the fundamental wave has advanced 30° in phase, or 1/12th of a cycle, the point, p, has moved to p' on the large circle, and its projected point has had a corresponding movement from P at the center of the large circle to P' above it.

During this time the point, q, rotating with twice the angular velocity, has advanced 60° on its circle, and also the whole circle in which q revolves will have moved up to the position shown in dotted lines. The point, q, will, therefore, have moved to q' on its dotted circle, and its projected point on the vertical axis will have moved from Q to Q'.

At the same time point r, moving with three times the angular velocity of p, will have advanced 90° on its circle, that circle also having moved into a new position as shown by dotted lines. The new position of the point, r, is, therefore, at r' and its projected point has moved from R to R'.

It is to be noted that the diameter of the circle of reference of the fundamental

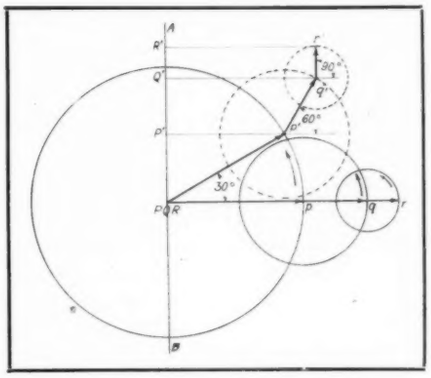


Fig. 34. Combination of Three Simple Harmonic Motions.

movement requires extension since the displacements in the complex wave will often exceed the amplitude of the fundamental wave. The resulting displacement (from O) of the point, R, is always the projection of the vector sum of the three radii carrying the respective points whose motions are contributing to the complex wave.

If the three circles of Fig. 34 are considered as cog wheels, geared together on the centers and with the respective ratios mentioned, then the shadow, R, which a pin at r would cast on the vertical line, AB, would move with the complex periodic motion produced by the three simple wave motions. This conception may be extended indefinitely, by considering as many additional orbits or cog wheels as may be required to represent all the components or higher harmonics constituting the complex periodic wave-form under consideration.

The radii of the added wheels will correspond respectively to the amplitudes of the components and their speeds, always geared to exact multiples of that of the lowest wheel, will represent respectively the successively higher frequencies of the series of harmonics comprised in the complex wave. These frequencies must always be exact multiples of the fundamental frequency.

We may graphically coordinate with time the displacements of these three harmonic motions and of their resultant as in Fig. 35. This is drawn to the same scale as in Fig. 34 to enable ready comparison of the various values. The three wave

forms traced by the movements of the points, P, Q and R, are simple harmonic waves having frequencies proportionate to 1, 2 and 3, respectively.

It will be noted that, in accordance with the conception of Fig. 34, two cycles of Q and three of R are included in a single cycle of P. The heavy resultant wave-form is found by taking for each point on it the algebraic sum of the corresponding ordinates of the three component waves.

An examination may be made of the conditions at any phase of the cycle, either by studying the wave forms at the right or the vector diagram at the left of Fig. 35. The conditions indicated by the arrows on the vector diagram are those at the instant when the fundamental wave has advanced 30° in its cycle.

The value of the resultant displacement at this instant may be found by treating the arrows as though they were forces, combining as by a parallelogram of forces the values of p' and q' to obtain the displacement at that moment due to the fundamental and first harmonic waves, P and Q, respectively, and then forming a parallelogram of this resultant with the arrow, r, to obtain the instantaneous displacement due to the combined action of all three waves. The same result is found by adding the ordinates of the three component waves on the 30° phase.

One may ask concerning the limitations of this ability to produce complex periodic wave motions by combining simple harmonic motions. Within finite limits there are none. Any periodic wave form, whether it consists of combinations of curved or of straight lines, may be so compounded if only enough properly-chosen simple harmonic waves are employed.

Graphic Representation of Sound Waves

We may employ such curves as those of Figs. 32 and 35 in the analysis of sound waves with two different conceptions in mind.

In one, which was that used in the discussion of Fig. 32, the successive points on the curve represent the successive displacements of the vibrating body as time progressed. In the other, applicable particularly to sound waves in air, the successive points on the curve may be considered as indicating the respective displacements *at a given instant* of the successive air particles engaged in the wave.

The curves of Figs. 40 and 41, illustrating these two conceptions, are exactly alike, the notations only differing. The essential difference in the two conceptions is that in one horizontal distances represent the passage of time; in the other the traversing of distance.

Either the time or the distance may be measured in any appropriate units. For instance, in the conception of Fig. 40, time may be expressed in seconds, or in any function directly dependent on time, such as the passage of the imagined point on the circle of reference, expressed in angular measure or in radians measured around the circle of reference.

In Fig. 41, as before, the ordinates above or below the horizontal axis represent displacements. The successive points along the curve represent, therefore, the positions

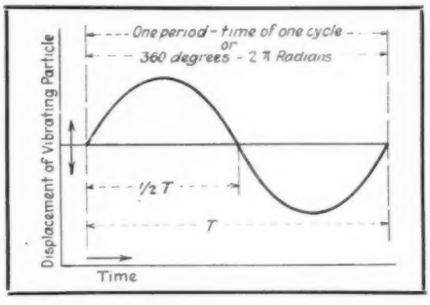


Fig. 40. Displacements of Vibrating Particle with Lapse of Time.

of the successive particles engaged in the wave all at the same instant of time. Here then we have the representation of a complete simple harmonic wave in air.

Starting at a the particle of air would be in its neutral or normal position. Passing farther along a distance, a-b, from the source of the sound, the displacement of the particle normally at b would be indicated by the ordinate, b-b'. At the distance, a-c, the displacement would be represented by c-c', and so on; the particles at a, e and g having no displacement, those at c and f having maximum displacement.

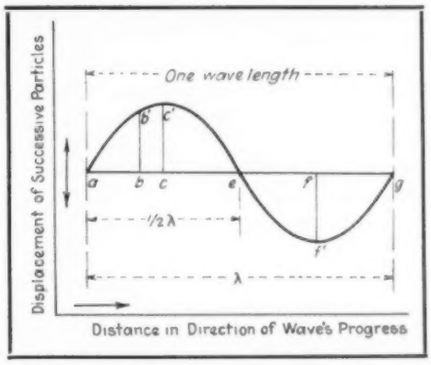


Fig. 41. Positions of Successive Particles in Wave at any Single Instant.

This diagram of Fig. 41 we may consider as representing the cross-section of a wave at a given instant. Obviously, then, the distance, a-g, is the wave length—that is, it is the length between corresponding points on successive waves. Looking at it in another way, it is the distance that the wave front travels for each complete to-and-fro vibration of the sounding body, or for each cycle.

Obviously there is an exact relationship between wave length, frequency, and velocity in a given medium. If the frequency is known as so many cycles per second, then the sound must travel that many wave lengths in a second; i. e., the product of wave length and frequency must be the speed at which sound travels.

The wave length, therefore, in a given medium, is the speed of sound in that medium divided by the frequency. The Greek letter λ (pronounced lambda) is commonly employed as the symbol for wave length. The relationship between wave length, velocity and frequency is thus expressed algebraically:

$$v = f\lambda \text{ or } \lambda = \frac{v}{f}$$

To illustrate by a few examples of familiar sounds occurring in air: The note of a very low organ pipe may have a frequency of 20 cycles per second. We know the speed of the sound to be about 1,132 feet per second. Therefore, the wave length of that sound will be 56.6 feet.

Going to the other extreme and considering a sound so shrill as to be scarcely audible, the rate of vibration or frequency would be perhaps 10,000 cycles per second, in which case the wave length would be only about 1.36 inches. Middle c on the piano, with a frequency of 256 complete vibrations a second, would have a wave length of 4.4 feet.

Contrast these wave lengths with the amplitude of the waves. These are nearly always measurable in very small fractions of an inch—in fact, it is known that vibrations less than one millionth of an inch in amplitude produce sounds readily discernible by the human ear.

Whether we consider the curve as representing the successive displacements of the *same* particle of air with the passage

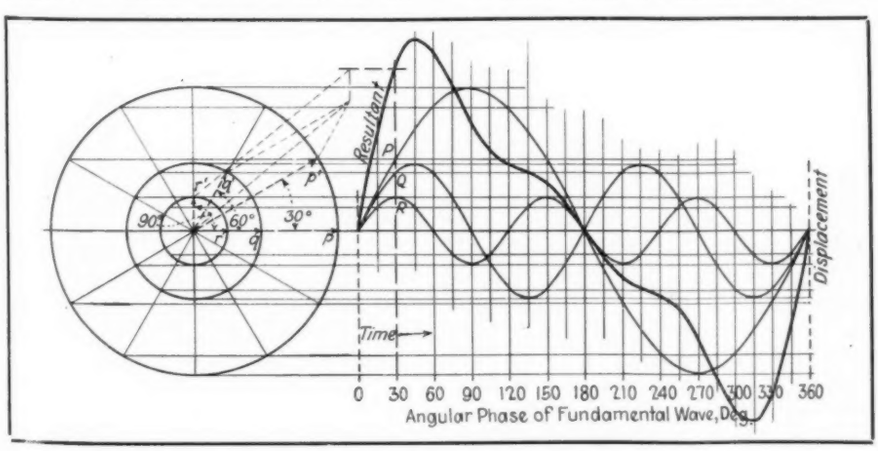


Fig. 35. Vector Diagram and Wave Form of Three Simple Harmonic Motions.

of time, as in Fig. 40, or as representing the displacement of *successive* particles in a wave at a given instant as in Fig. 41, it must be kept in mind that the vibrations in a sound wave are longitudinal and the displacements of the particles in such curves would all be either to the right or left, along the horizontal axis.

In order to represent them graphically, on a surface, however, the distances through which the particles have moved are shown at right angles to the directions in which the movements actually occur, those displacements in a positive or forward direction being shown above the axis, those in a negative or backward direction below the axis.

In order to secure visible magnitudes in our diagrams it is necessary to plat the vertical distances representing displacement on a greatly enlarged scale. The actual displacements caused by a sounding body are usually very minute, often of the order of 1/100,000th of an inch, whereas the actual wave length, as has just been shown, may vary from an inch or less up to perhaps a hundred feet. If we attempted to lay out such a curve to actual scale, it would not differ visibly from a straight line. (*To be continued.*)

"Open House" in Celebration of New Building and Equipment.

The Lincoln Telephone & Telegraph Co., Lincoln, Neb., held open house at its Dorchester exchange for two days recently, in celebration of the new office building and new central office equipment installed when it cut over from magneto to common battery service. Nearly 400 persons attended.

Guides were supplied, and at the conclusion of the tour refreshments were served the guests, each of whom was also given a souvenir of the occasion. J. A. McKenzie, district manager, and C. Haberman, manager at the nearby exchange of Friend, who also has supervision over Dorchester, assisted in doing the honors.

New York Upstate Association to Hold District Meeting.

The Up-State Telephone Association of New York will hold a district meeting and traffic conference at Lakeland Tea Rooms, Cazenovia, Thursday, June 12.

"All available operators should be present to learn the new rules and methods in traffic work," says President J. G. Ihmsen of the association. "The new law which requires all small telephone companies to establish an accounting system, eliminate discrimination, file a schedule of rates and make regular reports to the New York Public Service Commission will be explained and discussed."

Theodore N. Vail 1929 National Awards

Five of Nine National Awards Under Vail Memorial Fund Go to Ohio Telephone People—Gold Medal Awarded Miss Gladys I. Gibson, Posthumously, Heroine of Cleveland Clinic Disaster—Three Women Honored—The Citations

Heading the roll of nine telephone men and women honored by the 1929 national awards of Theodore N. Vail medals, is the name of Miss Gladys I. Gibson, operator at the Cleveland Clinic, Cleveland, Ohio. The award of a gold medal goes to her posthumously.

The other national awards, which were announced on June 1, are:

Gerald T. Mahaffey, district traffic superintendent of the Ohio Bell Telephone Co., Cleveland, who receives the only other gold medal presented besides that given to Miss Gibson. With his medal goes a cash award of $500.

Silver medals with cash awards of $250 in each case go to:

James J. Roonan, district installation foreman, Ohio Bell Telephone Co., Cleveland.

Benjamin G. Spaeth, district plant superintendent, Ohio Bell Telephone Co., Cleveland.

Walton A. Turner, Jr., district outside maintenance foreman, Ohio Bell Telephone Co., Cleveland (posthumous award).

Miss Iola D. Gibbons, night chief operator, New Jersey Bell Telephone Co., Woodbridge, N. J.

Ephraim W. Decker, repairman, New York Telephone Co., Rosebank, S. I.

Miss Vivian Harper, operator, Elba Telephone Co., Elba, Ala.

Mrs. Myrtle Dorothy Dull, agency chief operator, Southwestern Bell Telephone Co., Elmdale, Kans.

All of the awards to the men of the Ohio Bell company were in connection with their conduct following the disastrous explosion and fire at the Cleveland Clinic on May 15, 1929.

The Vail Medal awards are made annually and are provided for by the Vail Memorial Fund established as a memorial to Theodore N. Vail, former president of the American Telephone & Telegraph Co. Under the terms of the establishment, bronze, silver and gold medals are awarded to members of the Bell telephone organization throughout the United States, for acts or services which conspicuously illustrate Mr. Vail's ideals in public service.

The Vail medals are not awarded merely for acts of heroism or spectacular deeds, although noteworthy heroism often characterizes the service performed, nor as a reward for faithfulness in the performance of daily tasks, but rather to honor the memory of Theodore N. Vail, by special recognition of a few of the most conspicuous examples of noteworthy service that are daily occurrences among employes, characteristic of the spirit of service throughout the Bell telephone system.

The bronze medals are awarded by regional committees, appointed from the territory of each associated company of the Bell system. Each of these committees designates the members of the telephone organization in its own territory to receive these medals. A total of 55 bronze medals have already been awarded for noteworthy services during 1929.

The awards of gold and silver medals are determined each year by a national committee of award, which reviews the cases in which bronze medals have been awarded, together with any other cases which may be submitted, selecting for special recognition, without regard to locality, those whose services seem to have been of conspicuous excellence or importance.

Each silver medal award may be accompanied by a cash payment of $250, and each gold medal award by $500, or in case of a very exceptional act or service, by a cash award of $1,000. As a general rule, the total number of silver and gold medals awarded in any year will not exceed ten.

In addition, bronze plaques commemorating the gold and silver awards are presented to the companies whose employes have received these awards.

The citation which accompanied the posthumous award to Miss Gibson is:

"For supreme courage, loyalty and devotion to duty at a time of public disaster.

On May 15, 1929, about 11:30 a. m., a fire and several explosions occurred at the Cleveland Clinic immediately filling the building with poisonous gas which caused the death of more than 120 people.

While choking from the gas fumes and struggling for breath, Miss Gibson asked the local exchange operator to call ambulances and the fire and police departments, but was unable to complete her message.

Rescuers found her lying over the switchboard in an unconscious condition and were unable to revive her. The cords plugged into the lines throughout the building were mute evidence of her valiant effort to spread the alarm, while a few feet away a window offered a means of escape."

Mr. Mahaffey received his award for

his actions at the same fire in Cleveland. His citation is "for conspicuous courage in saving human life, resourcefulness, initiative, and devotion to duty in reestablishing and maintaining telephone service in the face of great personal danger at a time of public disaster."

"Despite danger from the poisonous gas," it continues, "Mr. Mahaffey, with a dampened handkerchief over his nose and mouth, went into the building and carried out several victims. Then, reentering the building, he found his way to the switchboard and operated this board until other emergency service was provided.

"Throughout the disaster, he supervised the efficient organization of the central office forces to handle the increased traffic, and directed the calling of doctors and ambulances and the organization of information bureaus, thereby greatly facilitating the rescue and identification of the victims. He continued his activities throughout that day and evening until the effects of gas and physical exhaustion compelled him to accept medical attention."

The citation to Mr. Roonan was "for conspicuous courage in saving human life and resourcefulness and devotion to duty in restoring telephone service in the face of great personal danger at a time of public disaster."

"Despite danger from the poisonous gas, Mr. Roonan, with a dampened handkerchief over his nose and mouth, went into the building and rescued several victims. Reentering the building, he supervised and assisted with the installation of the first emergency telephone equipment, by means of which the rescue work was greatly facilitated.

"He next assisted in relocating the switchboard and installed additional telephone instruments. He continued on duty for about 48 hours until telephone service was permanently established in a nearby building."

Mr. Spaeth was cited "for conspicuous courage, resourcefulness, initiative and devotion to duty in re-establishing telephone service in the face of personal danger at a time of public disaster.

"Mr. Spaeth went to the building and, after arranging with police authorities to pass telephone men through the fire lines, he immediately proceeded to plan and install emergency telephone facilities which were invaluable in the calling of doctors and ambulances and the furnishing of information to the press and to relatives and friends of the victims of the disaster. He continued his activities throughout that night and the next day, and remained in charge until permanent equipment had been installed."

The award to Mr. Turner is a posthumous one, as he died on February 22, 1930. His death was in no way attributed to the Cleveland disaster.

His citation is "for conspicuous courage in saving human life and resourcefulness and devotion to duty in restoring telephone service in the face of great personal danger at a time of public disaster.

"Despite danger from the poisonous gas, Mr. Turner, with a dampened handkerchief over his nose and mouth, went into the building and rescued several victims. Re-entering the building, he reached the switchboard and assisted in answering calls with his hand test set. He then supervised and assisted with the installation of the first emergency telephone equipment, by means of which the rescue work was greatly facilitated. He continued on duty for about 48 hours until telephone service was permanently established in a nearby building."

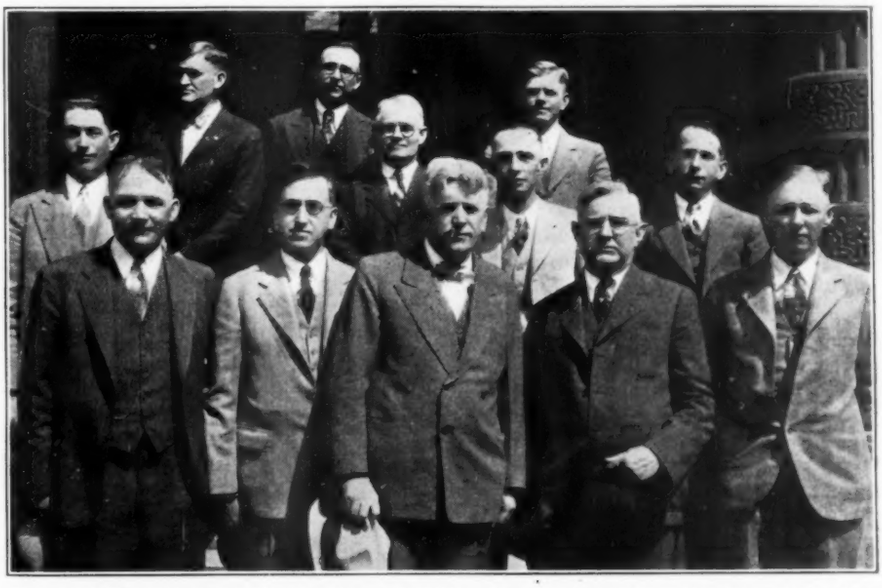
Miss Vivian Harper, operator of the Elba Telephone Co., Elba, Ala., won a silver medal for her courage on March 14, 1929, when the town of Elba was completely flooded by a ten-foot rise of water in two hours.

Disregarding personal danger Miss Harper sent warnings throughout the town and to the neighboring town of Geneva which was in the path of the flood, and directed rescue work until every telephone failed. The central office building subsequently collapsed.

E. W. Decker of the New York Telephone Co., Rosebank, Staten Island, N. Y., on January 26, 1929, while on duty at Rosebank, risked his life in pulling a boy off the third rail of the tracks of an electric railway, near where he was at work. Although the boy, severely burned, had ceased breathing, Mr. Decker started artificial respiration and revived him.

Miss Iola Gibbons, night chief operator, New Jersey Bell Telephone Co., on May 6, despite an explosion in an adjoining building, which seriously rocked the Woodbridge central office, throwing her to the floor with injury to her face and scalp, notified the authorities of the disaster and remained at her post until a police officer forced her to leave the burning building. She then went to the police headquarters where she continued to notify company officials of the emergency until relieved.

Mrs. Myrtle D. Dull, agency chief operator, Southwestern Bell Telephone Co., Elmdale, Kans., on July 11, 1929, gave warnings of a flood which was endangering her own office. By notifying railroad officials she probably averted the wreck of a passenger train. As the water rose, Mrs. Dull elevated her switchboard on boxes and continued on duty. She remained on duty without relief until the following day, thus maintaining practically uninterrupted service.



Group of Executives of Middle States Utilities Co., Holden, Mo., at a Recent Meeting at St. Joseph, Mo. President John A. Reed, Cedar Rapids, Iowa, is Third from Left in Front Row, with General Manager M. L. Golladay of Holden at His Left, and Commercial Manager R. E. Long, Plattsburg, at His Right.

Executives of Middle States Utilities Co. Hold Conference.

The Middle States Utilities Co., with headquarters at Holden, Mo., recently held a meeting of its district managers and department heads at St. Joseph, Mo.

Those present were: John A. Reed, president, Cedar Rapids, Iowa; M. L. Golladay, general manager, Holden, Mo.; John J. Cline, chief engineer and plant manager, Plattsburg, Mo.; Elmer Weakley, general auditor, Plattsburg, Mo.; R. E. Long, commercial manager, Plattsburg, Mo.; Eugene Todd, traffic manager, Plattsburg, Mo.; W. H. Liddle, Jr., equipment engineer, Bethany, Mo.; S. D. Thompson, district manager, Cameron, Mo.; Thos. Epperly, district manager, Leon, Iowa; W. H. Megrew, district manager, Sidney, Iowa; W. C. Wilkin, district manager, Princeton, Mo., and W. J. Frost, district manager, Memphis, Mo.

Here and There in Telephone Work

That New Man Who Enters the Telephone Industry.

We are approaching the time of the year when a great many new faces will appear at the desks and in the crews of the telephone industry.

Let us welcome these new faces and their owners in a way that will show our genuine feelings toward them—not necessarily with outstretched arms and a broad smile, and certainly not with a grudge, or a word of mistrust behind their backs: rather with a handclasp of friendship and a look deep into their eyes that searches for an inner expression of value.

Let's, in a measure, hold ourselves for the future worth to the telephone industry, of the new man who comes into our office or gang. Let's carefully teach him what he should know of our work in a way that will be easy for him to understand. Let's make our company's interests his interests as well as our, insofar as we can.

Some will be quiet, modest and slow. Some will be quick, aggressive and possess experience. We must give experience all due credit, but we must also realize that a man's value lies not in the things he has done, the material value and usefulness of which may now be obsolete, but in the things he is able to do; his ability to grasp new situations and reason out the cause and effects of the results obtained with his working tools.

Let's give our new fellow employes the start that would do us the most good.

Beaverton, Ore. LEWIS SMITH.

Looks After Welfare, Comfort, and Entertainment of Employes.

In this article we shall peer beneath the surface and into the workings of the department that silently looks after the welfare, comfort, and entertainment of telephone workers of the Pacific Telephone & Telegraph Co. in Southern California.

Here we find conditions that are unique. The operators' quarters department in Southern California includes a number of sub-departments whose problems are unusual in their individuality, but whose function and duties are so closely interwoven as to necessitate their being combined under one department head. This department, whose mechanism is so finely organized, embraces all of the southern territory.

Probably the most interesting feature is the dining room. There are eight dining rooms now in operation in Los Angeles, two in Pasadena, two in San Diego and one in Glendale. These dining rooms serve approximately 4,500 meals to employes daily.

In the Los Angeles Hill street building, where the dining room is open for service day and night, about 1,700 meals are served every 24 hours. This service must be adequate, owing to the many shifts of hours worked by the operators, to take care of several spasmodic periods during a day. In fact, the adequacy of this department is tested by more than one unusual condition.

The menus are prepared each week by an expert in the office of the operators' quarters manager. Under the plan of employe representation, committees are frequently consulted as to their preference in this regard and the menus prepared accordingly. The health course supervisor is also consulted concerning combinations of foods and other items pertinent to the health of the employes. It is the intention of this department to cooperate at all times with instructors conducting the health course.

No food substitutes whatever are used. For example, the blend of coffee served is the same blend that is used by certain of the best Los Angeles hotels. In the larger dining rooms the cakes, pies and rolls are baked in the company bakeries. These are made of the purest ingredients that can be obtained and by persons who have a genius for such things. Eggs are furnished exclusively by a suburban rancher.

The prices charged employes are sufficient to cover only the cost of food and service. The cost of rent, heat, and equipment is taken care of by the company and not, at any time, charged to the expenses of this department.

In this territory, employes do not pay cash for their meals. This item is taken care of by the charge system. The routine is very simple. A girl enters the dining room, selects such food as she desires, borrows a pencil from the matron, signs her name and worries not about payment until pay day. This system is considered a convenience by the operators, since it enables them to keep a systematic account of their personal finances, and—if they haven't been systematic—the advantage is most obvious.

Many operators, especially those who do not have relatives in the city, find it cheaper and more convenient to eat all their meals in the telephone company dining rooms and do not pay board bills elsewhere.

As an illustration of efficiency and organization, let us review some of the large affairs which were made possible by this department. In one instance a complete turkey dinner was served to 300 pioneers of the company. This dinner was prepared in addition to the regular daily service. On another occasion, during a chief operators' conference, luncheons were served to 200 people on two consecutive days.

Combination Dining Room and Restroom of the Southern California Telephone Co., Washington Office, Los Angeles, Calif.

This department also takes care of banquets and dinners for officials of various departments. It has, on certain occasions, arranged luncheons for the general manager and visiting officials in the company dining rooms.

The food for employes' banquets and parties is always served at actual cost.

In some of the smaller offices it is not practical to maintain a dining room. The restrooms in these buildings are supplied with kitchen equipment for the convenience of the girls.

The restrooms are more like a library or a den. In some of the restrooms there are small libraries which are owned and maintained by the operating forces. In the kitchenettes the girls prepare not only daily luncheons, but refreshments for parties and dinners.

The furniture, draperies and rugs, etc., for the restrooms throughout the entire territory are selected by the operators themselves through the channels of the plan of employe representation. This is a matter of almost personal pride among the girls, and you may well imagine that each office building boasts the most beautifully appointed quarters.

The larger of these rooms are furnished with phonographs. The phonograph records, too, are selected by the operators' committee, as are the current magazines which are provided by the department.

Adjoining the restrooms are "quiet" rooms. These rooms are furnished with sufficient number of day beds and steamer robes to accommodate employes who are ill or those who wish to recline. This sub-department also provides medicines and medical equipment. In the larger office buildings a matron is stationed in the "quiet" rooms to care for girls who are ill.

The last, though not the least significant of the sub-departments, is the recreation rooms. These rooms might well be termed halls, since they are large enough in which to hold dances and parties. Here phonographs are also furnished, and any other equipment necessary for special occasions, such as entertainments or parties for children at Christmas time. These rooms are also furnished; in some cases with pianos purchased by the operating forces and maintained by the company.

During the Christmas season this department provides Christmas trees, the decoration of which is usually made a rite by enthusiastic chairmen of the plan of employe representation.

Approximately 100 persons are employed in this territory to look after the operators' quarters. It is also the duty of these employes to supervise the lighting and ventilation of these quarters and to look after the operators' needs in general.

Suggestions offered by operators from time to time concerning the operation or equipment of their quarters are presented to the operators' quarters manager on his periodical visits through the territory for his consideration. Such ideas as are applicable are used.

This practice has created an interest among the operators that has served not only to make these quarters homelike, but to make them radiant with a spirit of good fellowship.

A Postal-Card Stunt for Curing the Service Sponger.

This stunt is aimed at the people who have considerable use for telephone service, but who, in order to avoid paying for it, make a practice of using their neighbor's. It can be used only in exchanges of 1,000 stations or less, because it is only in the small exchanges that the operators are able to recognize most of the patrons by their voices and are well enough acquainted with the people of the community to name the spongers.

To charge non-subscribers five or ten cents per call for talking from a private telephone, as many companies do, is seldom entirely successful, for it requires that the operators spy on every conversation, and this cannot be done by busy operators.

While some subscribers are offended if neighbors are charged for talking from their telephones, there are many who complain that they are imposed upon by non-subscribers whom they do not wish to offend, and they ask the telephone company to devise some means for relief. The most satisfactory solution of this problem for the telephone company is one which converts the annoying parties into regular subscribers.

We have often used this postal card stunt very successfully to bring installation orders from service borrowers. A supply of cards is printed to read:

.....193....

Mr.....

.....

Dear Sir:

Our operator reports that you talked today from No..... At a very small cost you may enjoy the convenience of a telephone at your own place. Kindly let us know if you are interested.

Yours very truly,

Home Telephone Co.

Every time an operator detects a non-subscriber using a neighbor's telephone, one of these cards is properly filled out, addressed and placed in the mail. The message on the card is not discourteous, and it usually touches a guilty spot in their conscience.

It does not imply any lack of neighborliness on the part of the one whose telephone has been used, and yet they feel ashamed to go back again. The fact is, they don't like to get the card; and if they really need the service, they usually order a telephone.

Only the most hard-boiled individuals persist in appropriating service if they receive one of the cards every time they do it. In some exchanges where we have used this stunt, it has completely cured the sponging habit and added a considerable number of new telephone subscribers.

Geneseo, Ill. R. L. Parker.

Says Few Rural Telephones Mean a High Death Rate.

An influence of good telephone service on the death rate of a community was urged recently in Great Britain by Major Burdon Evans, who appeared before the Montgomeryshire National Health Insurance Committee, at Welshpoole, to urge extensions of the governmental system of rural telephones.

In the Machynlleth rural district of Wales, Major Evans reported, the death rate for the past nine years has been 16.1 persons per thousand of the population. This district has little telephone service so that messengers may need to travel 15 miles or more, the major reported, in order to summon a physician in an emergency.

In the remainder of the same county, provided with more adequate telephone service, the death rate for the same period was reported as only 13.7 persons per thousand of population, disclosing an excess of nearly 18 per cent of deaths in the telephoneless district as compared with neighboring regions with telephones.

Many illnesses and accidents which will prove fatal if no physician is quickly available are easily cured, the major pointed out, by prompt professional aid. No small part of the lower death rates of cities in recent decades may be ascribed, it is probable, to telephones, improved ambulance service, quicker ways of getting other kinds of help in emergencies and so on, rather than to sanitation or medical advances.

Similar effects of poor communications may be important also, it is suggested, as one cause of the relatively high death rates in so-called backward nations, often ascribed to poor food and bad sanitation.

Pennsylvania Bell Workers Carry Identification Cards.

A new method of identifying those of its employes whose duties necessitate their entering homes and business establishments has been inaugurated by the Bell Telephone Co. of Pa.

The company has issued to each employe whose work brings him in contact with the public, a card bearing his photograph, typewritten name and signature. The cards replace the familiar metal, bell-shaped badge which installers, repairmen and others in the company's service had worn for many years.

In addition to the employe's photograph, name and signature, each of the new identification cards bears the signature of the head of the department with which the employe is associated.

While the photograph on the card serves to establish the identity of the bearer in homes and commercial establishments, the additional check of having the possessor of the card furnish his signature also can be made, if believed desirable. The old bell-shaped badges have been gathered up and destroyed.

One Directory to Every Four Persons in Ohio.

Enough telephone directories to provide a copy for every four persons living in Ohio are printed each year by the Ohio Bell Telephone Co.

There were 35,000,000 copies of the telephone directory printed in the United States in 1929. Of this number, 1,614,978 copies were prepared and distributed in Ohio by the Ohio Bell Telephone Co.

MARSHALL, MINN

The Latest Addition To

THE exchanges listed below, selected at random from orders received from Independent companies during the last twelve months illustrate the adaptability of Strowger equipment to the needs of exchanges of various sizes. This list does not include any of the numerous Independent exchanges of less than 100 lines for which orders were placed.

Jamestown, N. Y. (4660)
Albert Lea, Minn. (1900)
Columbus, Nebr. (1200)
Laurens, S. C. (500)
Dowagiac, Mich. (700)
Lakewood, N. Y. (200)
Frewsbury, N. Y. (100)
Union City, Mich. (175)
Wingate, N. C. (100)
Kernersville, N. C. (130)
Weekapaug, R. I. (100)
Weldon, N. C. (300)
Roanoke Rapids, N. C. (500)
Clintonville, Wisc. (360)
Chrisman, Ill. (225)
Harvey's Lake, Pa. (150)
Guadalupe, Cal. (100)
Carpinterea, Cal. (210)
Goleta, Cal. (120)
Seward, Nebr. (700)
Ayden, N. C. (120)
Martin, Tenn. (425)

THE Tri-State Telephone a[rapl] placed orders with Automat[ic In] Automatic Dial equipment [all,]

That Strowger Dial equi[s e] exchanges of this "in-betwe[s in] large number of orders for such size[ges] year. A careful study of the rem[reco] established by exchanges of this size [nde] convincing proof as to their practical s[and]

Future profits are invariably the res[rese] companies such as the Tri-State Te[and] converting their exchanges to Strow[tion] warrant, are assuring for themselve[ed] operation for the years to come.

Automatic In[c]
Man[ufacturers]
STROWGER AUTOMATIC DIAL TE[L SIGN]
Factory and General Offices: 1033 W[eet, C]
Sales and Service Offi[ces in Cities]

GENERAL EXPORT DISTRIBUTORS
The Automatic Electric Company, Ltd., Chicago

In Canada . . . Independent Sales and Engineering Co., Ltd., Vancouver
In Australasia . . . Automatic Telephones, Ltd., Sydney
In Japan . . . Automatic Telephones Ltd. of Japan, Tokyo

STROWGER DIAL SY[STEM]

When writing to Automatic Electric Inc., please mention TELEPHONY.

NSOTA

The Strowger Roll Call

e a raph Company has recently
mat Inc. for 700 lines of Strowger
ent all, Minnesota.

equi eminently satisfactory for
twe s indicated by a glance at the
size ges received during the last
rem ecords of daily performance
ze nder dial operation, furnishes
al s and universal success.

res esent planning. Far-sighted
Te nd Telegraph Company, by
row tion as rapidly as conditions
elve ed expansion and profitable

atic Inc.

Mem
AL TE SIGNALING SYSTEMS
1033 W eet, Chicago, U. S. A.
vice Offi Cities

SSOCIATED COMPANIES

ago ric Company, Inc. . . . Chicago
utomatic Telephone Co., Ltd., London
Co., Ltd. phone Manufacturing Co., Ltd., Liverpool
, Sydney erp Telephone and Electrical
n, Tokyo . . . . . Antwerp

GE UTOMATIC
STEMS

When writing to Automatic Electric Inc., please mention TELEPHONY.

Increase Subscribers by Advertising

Every Product Manufactured Is Competing for the Consumer's Business and Advertising Used for Singing Merits of Each Except by Telephone Business—Address at Annual Convention of Ohio Independent Telephone Association

By Stuart Knapp Beecher,

Advertising Department, Stromberg-Carlson Telephone Mfg. Co., Rochester, N. Y.

It is a safe assertion that no operating telephone company has every possible subscriber on its list. Such a condition would be far too ideal for any sane person to ever hope to realize. However, it is a goal at which to aim.

The fact is that, in most communities, the number of telephone subscribers is absurdly small. In comparison to the products of many other industries, the product of the telephone industry, telephone service, is used by very few people. To us, telephone service seems as much a necessity as the daily paper. And yet there are thousands of people who seem to have at least average intelligence that own automobiles, have radios and even belong to clubs; but for some reason they do not have telephones in their homes.

What is the reason for this condition? To my mind there is just one answer, and that is a very simple one. For every product except that of a public utility, there are numerous companies competing for the prospective purchaser's business. Every one of these competing companies is singing the merits of its own product in a flood of newspaper and magazine advertisements, circular and letters.

The public, from the richest to the poorest, from the most intelligent to the most ignorant, continually have the desirable qualities of the product impressed on their consciousness. William Wrigley admits that he has made his millions through advertising. Cigarette manufacturers have taught our ladies to smoke; and Amos 'n' Andy have persuaded us to use trainloads of Pepsodent.

Some of us would undoubtedly chew a stick of gum after dinner, even though we had never seen a line of advertising concerning its beneficial effects. Queen Elizabeth smoked her pipe without other persuasion than the recommendation of Sir Walter Raleigh. And at least a few of us brushed our teeth twice a day with some sort of tooth paste before the Fresh Air Taxicab Co. of America was incorpulated.

There is, however, not the smallest doubt that the millions spent in advertising these products have been returned in billions to the sponsors. The absolute necessity of advertising is a proved, sound business principle.

A telephone operating company has but one product to sell—telephone service. As a public utility it is the duty of every telephone company to serve its community well. It is not serving its community well unless it puts forth every reasonable effort to have telephone service available in the home of every citizen of the community.

As a business enterprise it is the duty of every telephone company to earn as great a profit on the investment that it has made as possible. To do this, it must be constantly on the alert for new business and economical means of securing it. I submit to you that the most economical means of securing new business is through advertising, and shall attempt to point out the steps necessary to launch a campaign and the details of carrying it out. Before giving any consideration to ways and means of securing business, a complete and careful study of conditions must be made.

There Are Many Types of Advertising, According to Mr. Beecher, That Are Available for Use in Securing New Telephone Subscribers—Newspaper Advertising, Direct by Mail, and Radio.

The first positive fact you have at hand is the number of subscribers you have on your list. The second absolute figure you can get is the population of the territory that you serve. When you compare these two figures, almost invariably, you will find that the percentage of telephone subscribers to the population is ridiculously small. This population figure requires some careful study. The conclusions arrived at will vary greatly in different communities.

The object of studying population figures is to determine with some degree of accuracy the possible number of telephone subscriber prospects that are in the community. In some communities it is possible to assume that every family is a prospect. In other places, where a large part of the population is made up of unskilled, foreign labor, a considerable amount of judgment must be used to determine what percentage of the families are logically potential prospects for telephone service.

Furthermore, consideration must be given to the character of the districts served—whether it is residential, manufacturing or agricultural. In an agricultural or residential section, the maximum number of telephones is entirely dependent upon the number of families residing in the section, while in a manufacturing section the large number of instruments required for intercommunicating systems, as well as outside communication, greatly increases the possibilities of the telephone company.

In any case, before deciding on methods of securing additional subscribers, it is absolutely important that the number and kind of new subscribers that you can reasonably expect to secure be determined. When that has been decided there is a definite mark to go after.

Then the question of how much can be expended for the purpose must be answered. The best way of determining how much to spend is to appropriate a definite percentage of the income that will be secured from the new business created.

The percentages of appropriations for advertising to gross sales varies greatly in different industries and among firms within any industry. Some concerns get by with as low as 2 per cent, while others run to 20 per cent or even higher when they start out to create new business, either for a new product or in a new territory. A telephone company can afford to use a fairly high percentage of the revenue secured from new subscribers in order to get the business, because once a subscriber is added to the books he is pretty likely to stay.

My opinion is that the total cost of advertising, selling and installing should not exceed the revenue to be received for a period of six months. On this basis, 15 per cent to 25 per cent of the anticipated additional revenue for the first year can be appropriated to advertising. In many instances, satisfactory results can be secured at a much lower cost.

When these two questions, "Who are the logical prospects for new or additional telephone service?" and "How much can be expended to convert these prospects into actual users?" are disposed of, the next step is to consider ways and means of securing the application for service.

While advertising alone will not add many subscribers to your list, it is a most effective introduction to the personal solicitor who actually gets the signature.

There are three types of service that every telephone company has to sell—main stations, extension service and P. B. X. service. Each of these services requires a different means of approach. Let us consider each separately.

In selling main stations, you are dealing with people who are not habitual telephone users, people who do not admit the convenience and value to themselves and their friends of having telephone service always at hand. These people must be educated.

It is a safe assumption that they read the local newspapers, which makes it a readily available medium through which to get a message to them. The advertisements need not occupy large space but they should appear frequently and should have a single theme that will tie them together. Each advertisement should take up one point, and only one point. The casual reader will not linger long enough on any advertisement to absorb more than one thought.

The first advertisement of a newspaper campaign should be large enough and spectacular enonugh to attract considerable attention. The general effect that you want to produce is to startle your community into the realization that you are really out to furnish telephone service to everyone, not just the few who come to you and ask for it. A coupon asking for names of prospects should appear on the first advertisement as well as every successive one.

An effective series of advertisements can be made by utilizing in illustration and copy the various situations that arise in everyday life where a telephone is of utmost importance. The following are a few suggested situations that are appealing for advertising purposes:

1. An undesirable individual prowling around the house, which makes it highly expedient to get in touch with the police.
2. A fire occurs, making quick communication facilities important.
3. A water pipe bursts and leaks all over the house because it is necessary to walk to a plumber instead of calling him on the telephone.
4. The baby is sick and has to be left alone while somebody runs for the doctor.
5. What the neighbor of the "telephone borrower" thinks.
6. The convenience of arranging a party.
7. Visiting with friends during bad weather.
8. Talking with friends or business associates in other towns via long distance.

Another type of advertising that is available for use in securing new subscribers is direct by mail. If you can get a list of people who should have telephone service but have not, a series of personalized letters with circulars is valuable.

Circulars may be prepared, expanding the thoughts expressed in the advertisements, and enclosed with personalized letters. Each letter should be short, but contain a pithy sales argument. They should be mailed frequently enough so that the prospect will not have forgotten the previous one before receiving the current one. A series of six letters mailed at two-week intervals should accomplish results. The last three letters should have enclosed with them an application card with a return envelope.

In small communities where the potential market for new subscribers is not more than 100 or 200, the cost of circulars will probably be prohibitive, in which case the letters can be used alone. The cost of having a few hundred letters multigraphed (or prepared by a similar process) and filled in with the personal name of the recipient, is not great. The effect is better if an official of the company signs each letter personally. However, if the number of letters is great, a facsimile signature can be used effectively.

A third media for advertising in the effort to secure new subscribers is radio broadcasting. If you are in a locality served by a local broadcasting station, by all means use it. Put on a good program with just as little advertising as you can and tell your story. It will get to the people you want to reach more certainly than any other medium you can select.

For your purposes, I believe daytime broadcasting is more effective than evening, and it has the advantage of being cheaper. After all, it is the women folk who use the telephone in the home, so stir them up to the point of wanting one. Select a time of day when they might want to use a telephone. Suggest the convenience of telephoning the grocery, or inquiring about a sick friend, or inviting the Smiths over for a game of bridge tonight.

While I have mentioned newspaper advertising, direct-by-mail advertising and broadcasting separately, a combination of any two or all three is more effective than any one alone. The three tie together, each reinforcing the others.

In endeavoring to induce your present subscribers to have extension service installed, any or all of the media used to interest new subscribers can be utilized. However, here is a very real opportunity to use direct-by-mail advertising economically. Every month, you are mailing every subscriber a bill. That two-cent stamp can just as well carry a message that will result in greater revenue to you. A letter or printed insert, or even the back of your bill, can carry the thought of the convenience of an extension telephone to the recipient of the bill.

Small inserts may have such titles as, "I am always upstairs when the telephone rings," "What a comfort when I am ill," "Now my guests don't have to stage a Quaker meeting when I am called to the telephone," or, appealing to the youngsters who have a lot to say about household affairs nowadays, "Now I can talk to Bill without the family hearing everything I say."

You might print a line on the bottom of your bill, "Please give me information on extension service," which the interested subscriber could check. Make it easy for the subscriber to make his wants known.

The third class of service that you have to sell—P. B. X. service—is the only one that presents difficulties in the way of advertising. Prospects are limited, but it is comparatively easy to find out just who they are. The cost of P. B. X. equipment is relatively large so that it is a case of getting down to facts and showing the prospect that he is going to get dollars and cents value for what he pays.

The only type of advertising that can be successfully used to aid in the sale of P. B. X. service is direct-by-mail, and this must be personal. In fact, it can hardly be classed as advertising but rather as direct sales. Personal solicitation can be helped a lot by letters pointing out the advantages of having outside as well as intercommunicating telephone service available to the various members of an organization through a P.B.X.

Regardless of what advertising medium is being used, or what class of service is being advertised, there is one point that should be continuously stressed—the cost. When reduced to cost per day, telephone service is so inexpensive that it is hard to conceive of anyone who can not afford it.

Limits Coin-box Talks in New York to Five Minutes.

The old chatty days over the coin-box telephone, the New York Telephone Co. has decided, shall be no more. "Instead of depositing the nickel and chatting on indefinitely," said Victor E. Cooley, vice-president of the company, "the user will finish abruptly and make way for the next in line."

Mr. Cooley explained that a local call always was limited to five minutes, and the front of every directory says so. But hitherto the five-minute rule was waived because it was less expensive to do that than to have every call timed. However, numerous complaints of abuse of the privilege have been coming to the company, so a timing device has been installed in all coin-booth telephones. Most chatterers, when ordered to "Deposit five cents, please," suddenly recall that they have nothing more to say.

Evolution of Toll Traffic Methods

Until the Year 1886 There Were No Experts in Traffic, Equipment or Accounting Work—Outline of Evolution of Work Unit, Peg Count, Etc.—Method of Timing Toll Calls—Paper From the Traffic Conference of National Convention

By A. C. Stuart,

Traffic and Equipment Engineer, Utilities Service System, Lima, Ohio

In going back to the beginning in telephone history we find from the time Alexander Graham Bell invented the first telephone in 1876 until the year 1886, there were no experts and no authority in traffic, equipment, or accounting. Everything was in a highly experimental stage with only small, isolated telephone exchanges springing up all over the country with no coordination.

In 1886, the first magneto multiple switchboard was put in service, and from that time until 1896 amateurs became engineers, proper equipment was discovered and improved upon, boy operators were replaced by girl operators, and long distance service was introduced.

In 1896 the first common battery multiple switchboard was put in service; and the first operators' school was started by the New York Telephone Co. in 1902. It was not, however, until 1895 that the Independent telephone companies became active, but by 1902 they had placed in service more than one million telephones.

Start of Traffic Engineering

So we find there was very little traffic engineering done or required before the year 1900. As the American Telephone & Telegraph Co. and its subsidiaries were the first operating companies in the larger cities and had the largest switchboards, they were the first to figure out and put into force regular operating methods in both local and long distance work.

From the first it was found necessary in toll work to make out a slip of paper or ticket so that a record could be had of each long distance call handled. Tickets were at first made out at both ends of the line, which was known as the "two-ticket" method. This was later changed to the "one-ticket" method because of the loss in operator and circuit time. Collect calls were accepted from the start, as the telegraph companies were accepting collect messages at the time and telephone companies had to compete.

At first no record was kept of the work done, but later it was found necessary to do it. Accordingly a code was figured out which, when placed on the back of the ticket, permitted the relief operator to know how far the call had progressed. It also was a record of what work had been done on the call, for peg-count purposes, and gave the accounting department a record to refer to in dealing with subscribers on disputed charges.

Force requirement, or the number of operators required at the board during the different hours of the day, was first accomplished by general observations based on the number of calls each girl handled per hour; but about the year 1898 the A. T. & T. Co., figured out a method by which different kinds of calls could be classified and divided into work units.

Definition of Work Unit

A work unit was considered the amount of work done by an average experienced operator in completing a call over a No. 1 Western Electric common battery multiple switchboard. It was found to take, on an average, 15.65 seconds to complete. Other type of calls which took longer to complete, were figured with this work unit as a basis, the result being termed a coefficient.

This work unit was determined by taking the average number of calls an operator could handle during a busy hour, which was found to be 230, and dividing this into the number of seconds in an hour, 3,600, which gave 15.65 seconds per call. The coefficient of different classes of calls consists of one or more units to represent that class of call. The coefficient, for instance, for a station-to-station call direct is 6.55 units or 102.5 seconds of time. Thus by the aid of the coefficient and a count of the different type of calls handled on our local or toll board, we are able to know how many operators are required at each hour of the day.

If all calls required the same length of time to complete as in the case of automanual operation, where four digits and a prefix are always set up on the keyboard, the figuring of an operators' schedule becomes very simple, for the units are all the same; but when it comes to figuring a toll peg count, the process becomes more or less complicated, because of the longer time required for the different classes of calls and the greater ratio of changes due to the length of operators' experience.

Taking Peg Counts

In class A offices with six or more local and toll operators, a supplementary peg count should be taken every six months, generally in July and January. In smaller offices once a year is sufficient. By supplementary peg counts, I mean a complete count of every call handled on both the "in" and "through" and "line" boards, which should include all work done by the operators. After a supplementary peg count has been reduced to coefficients and units, it is a very simple matter to adjust the operators' schedule to conform to it.

The supplementary peg count is then useful in adjusting future schedules without going to the trouble of figuring the number of units in each class of calls, by simply equating the number of "out" calls each hour in subsequent peg counts.

Great strides have been made within the past few years in saving operators' time and increasing the speed of service. For instance, the introduction of the combined line and recording method has increased the speed of service from six or eight minutes to two or three minutes per call. The multi-switch instructions, when followed out by all companies, reduce the holding time on built-up circuits and thereby the operators' time. Bulletin sheets placed under glass at each operator's position, giving the rate and route of frequently-called points together with other useful information, have been a large factor in saving time.

Call-Relay Key-Toll Board

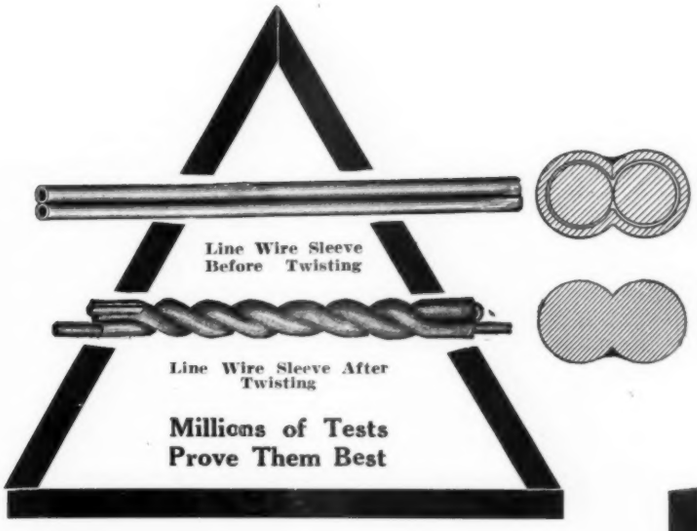
One of the greatest ovations in modern switchboards is the call-relay key-toll board which uses no cords or plugs. This board is especially efficient on "in" and "through" business, permitting an operator to handle from 350 to 500 units per hour with less exertion than in handling 260 units per hour on a cord-and-plug type board.

While the method of timing long distance calls has been greatly improved upon from what it was when the operator used an alarm clock for timing tickets, it is not perfect yet by any means. The calculagraph, which is the most accurate method we have at the present for timing toll tickets, depends entirely on the human element for its accuracy. If the operator does not see the supervisory light immediately, or is in the act of doing something else, the timing of toll ticket may be anywhere from 5 to 50 seconds off, which would mean a minute overtime charge, so far as the subscriber is concerned. I believe the time will come when toll tickets will be timed entirely mechanically and the result will be just as accurate as an electric, gas or water meter.

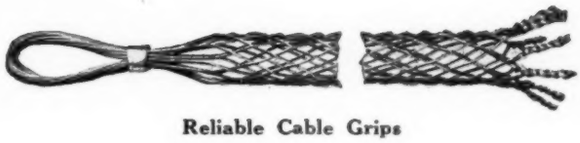
The ticket will be put in a slot opposite the pair of cords in use and a common clock-stamping arrangement which is connected in synchronism with a master clock, will stamp the ticket when the party starts to talk and again when they finish, and the

Reliable equipment will help you solve your PROTECTION problems

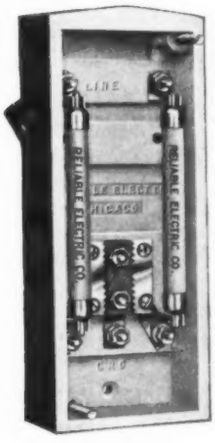
A27
Protected
Cable Terminal



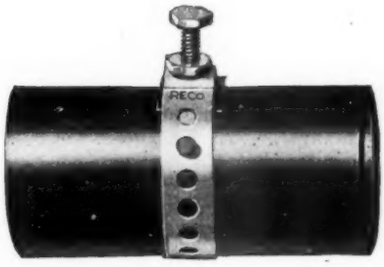
Millions of Tests
Prove Them Best



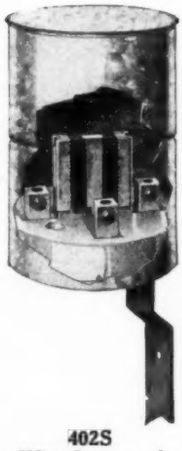
Reliable Cable Grips



997B
Station
Protector



Reliable
Station
Ground Clamps



402S
Weatherproof
Lightning
Arrester

"The Choice of the Majority"

Reliable Testing Clips

Reliable Electric Company

3145 Carroll Avenue CHICAGO, ILL.

operator will only be required to take down the connection. Disconnects will be accurately timed, and the subscriber would have no reason to question the timed allowance made for cut-off. Disputes on overtime charged would be eliminated entirely, for the operator could not be held responsible.

The matter of handling toll calls from a large toll center to a great number of tributary offices, where the station rate is not more than 10 or 15 cents, and make it pay has been a problem for a great many operating companies. The cost of making out a toll ticket is 2.8 cents and the operating cost is about 0.04 cents on a station-to-station call, so that the amount of profit derived after the circuit time cost has been deducted, is very small.

To correct this situation a method has been worked out which is known as "rapid-fire" toll service or as the Bell company would no doubt term it, AB toll connection. However, it differs from the AB toll in that the local operator does not make out the ticket, and with the automanual system is only instrumental in making the connection. This system is only in use, so far as I know, where automatic or semi-automatic exchanges are used for local service.

The method of placing a "rapid-fire" toll call is this: The subscriber dials or gives the number listed opposite the town he is calling, to the local operator who connects him directly with the toll line and automatically rings the tributary station. The tributary toll operator answers by giving the name of the town called. The subscriber then gives the name or number of the party he is calling, also his name and telephone number. The tributary operator makes out the ticket, completes the connection and times the call.

The disconnect is controlled from the toll center which automatically signals the tributary when the parties are through talking. The toll line is also arranged so that the tributary operator can call direct by common battery method to any subscriber she desires in the toll center exchange.

Where automanual or automatic equipment is used, there is another advantage in that the tributary operator can call from one tributary to another without interferring with the toll operator. It must be recognized that where this system is used, a sufficient number of toll lines to carry the load must be provided. These same toll lines may be terminated on the toll board and used by the toll operators as well as for "rapid-fire" toll calls.

The saving in this method is accomplished by cutting out one connection through the toll board, permitting the tributary operator who generally has idle time, to make out the toll ticket. It gives faster service by permitting the subscriber to give his call direct to the called toll tributary the same as a local call. It permits the tributary to call direct to the toll center subscribers or toll tributaries without going through the toll board. The tickets are mailed every five days to the toll center accounting department for billing to subscribers.

By the introduction of rapid-fire toll service we have increased our local toll business around Lima about 15 per cent.

You may be interested to know that in Europe at the present time a system has been worked out for metering each class of calls handled. The scheme is this: A message register which is associated with each subscriber's line and automatically controlled, will operate each time a call is completed. One count on this meter corresponds to the base area, which is a local or five-cent call in this country. If the subscriber calls outside of the base area, the mechanism automatically checks 1, 2, 3, or 4, whatever the correct tariff is, depending on the destination of the call. At the end of the month the meter is read and the billing is made based on the number of units used.

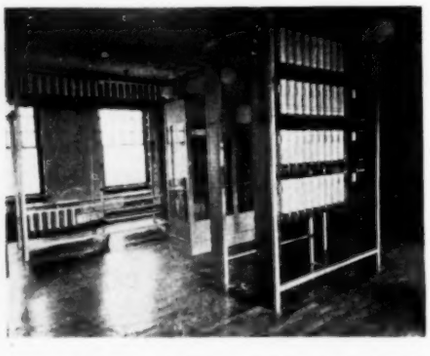
We are living in a machine age of highly-specialized subjects. The traffic problems of the future will see more of the mechanical and less of the human element. We weigh everything we eat, measure everything we drink, meter all of our light, heat and power, why should we not unit our telephone message. We would then learn to say more and talk less.

Dial Telephones in Clintonville, Wis.

Strowger Automatic Telephone System in Operation in Wisconsin Dairying and Cheese District—Territory Served and Description of the New Switching Equipment—Three Adjacent Exchanges Dial Clintonville Subscribers Direct

By R. F. Burfeind,
Sales Engineer, Automatic Electric Inc.

Clintonville is a town of 5,000 located in the heart of Wisconsin's dairy and cheese district. Its telephone system is owned and operated by the Urban Telephone Co., of which John H. Spengler is secretary and general manager. This company also owns and operates the telephone systems of three adjacent towns, namely, Mario, Tigerton and Bowler.



General View of Strowger Dial Switchroom at Clintonville, Wis.

All of these towns except the last named, are shipping points on Wisconsin Highway No. 26 and on the Chicago & North-Western railroad. The dairy farmers of the surrounding districts keep in constant touch with market and price conditions, and this business necessity has led them to use the telephone a great deal. Practically every farmer in this rich community has his telephone, and there are probably few rural areas in the country which have adjacent exchanges that are more closely co-related than are these four of the Urban Telephone Co.

It was with the idea of giving this area the very best service possible, that Strowger operation was adopted for Clintonville by the Urban Telephone Co. Since 1902, when John H. Spengler organized the Marion Telephone Co. with ten stockholders and ten subscribers, the cultivation of public good will by rendering excellent service has been a constant purpose.

Handsome New Telephone Building of the Urban Telephone Co. at Clintonville, Wis.

The Weston Wire-Chief Instruments

Only instruments of highest dependability can be entrusted with the responsibility of safe-guarding the nation's telephone service.

Where countless calls are made daily, Wire Chiefs know that "Westons" get the first call.

For 32 years Model 24 and Model 57 Wire Chief voltmeters have been standard equipment in central offices of telephone systems all over the United States. They have fully met the test of expanding telephone service, guarding many millions of miles of telephone wires and vast financial investments as well as insuring prompt and efficient service to millions of subscribers.

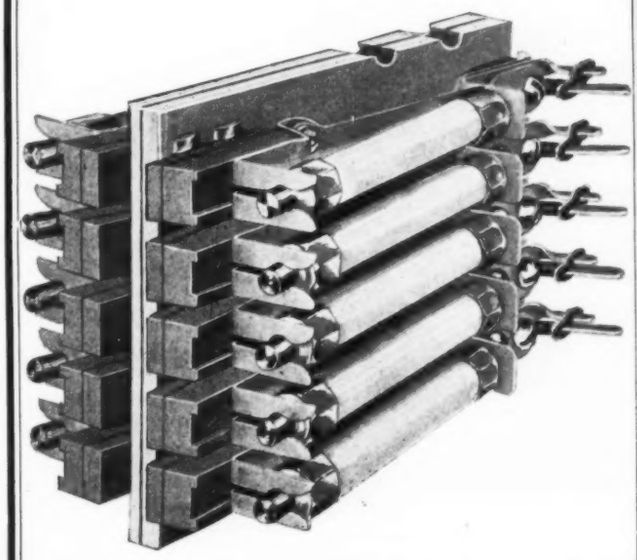
These two instruments represent highest Weston quality and performance and yet are most moderately priced. Model 24 is for average size switchboards and Model 57 for large switchboards. They are of the Permanent Magnet Movable Coil type for D. C. service only. Accuracy 1%. Both models are shielded from external magnetic fields.

Write to factory direct or nearest representative for specification details and prices.

Weston Electrical Instrument Corp.
576 Frelinghuysen Ave., Newark, N. J.

Weston
PIONEERS SINCE 1888
INSTRUMENTS

COOK



H36 CENTRAL OFFICE PROTECTOR

This is designed to protect circuits where heat coils are not required. The fuses and lightning arrester carbons are mounted on metal plates of the same length as those used for our Central Office Heat Coil Protectors.

Standard carbons, one plain and one grooved and "U" shape celluloids, .005 inch thick, are provided.

This Protector is furnished with wood or composition fuses, the latter being necessary where it is desired to meet Underwriters' requirements. Fuses are of 1 ampere capacity.

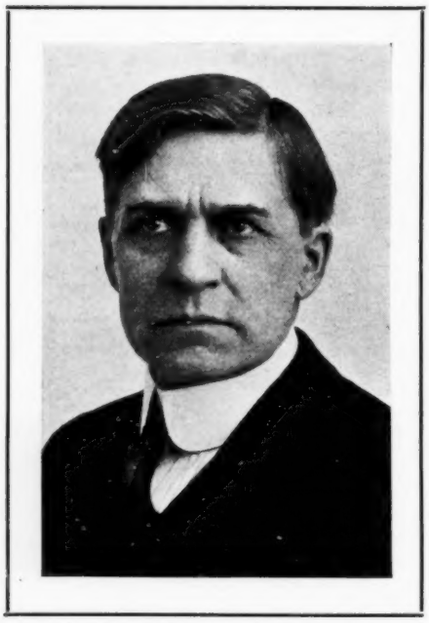
For exchanges where electric light and power hazards are not a factor, this protector will provide ample protection.

MANUFACTURED BY
COOK ELECTRIC COMPANY
2700 Southport Ave.
CHICAGO

It is a mark of distinction to say, "I saw it in TELEPHONY."

The growth of the system covering this area of approximately 300 square miles, from this small beginning to its present subscriber list of some 1,500 telephone users, is largely the result of this policy.

The new Strowger automatic dial equipment at Clintonville was cut into operation at 10 o'clock on the evening of May 1, 1930, in the presence of a group of interested visitors and officials. The first call over the new apparatus was placed by John H. Spengler, who dialed the number of Julius Spearsbraker, city clerk, who, in the absence of the mayor, responded for the city and congratulated the telephone company on the inauguration of the improved telephone facilities.



John H. Spengler, Secretary and General Manager, Was One of the Original Organizers of the Marion Telephone Co. in 1902. He Has Been Associated with it Ever Since.

The equipment consists of 360 lines, of which 90 are individual lines, 90 are P. B. X. lines and 180 are ten-party lines, or rather, party lines capable of handling any number of parties up to ten. Plunger self-aligning line switches are used, together with the usual selectors and connectors mounted on standard type frames.

Duplicate vibrator type ringing sets are furnished, which supply five frequencies of non-multiple harmonic ringing current. The power is supplied by a 12-ampere Tungar rectifier. The full floating scheme of charging is used for the batteries, the whole arrangement being automatically controlled by the action of high-low voltage relays. Provisions are made for remotely controlling the charging set and ringing vibrators if desired.

A one-position toll board with a student's position, is used to care for rural, information and special services, including toll calls for the exchanges of the Urban Telephone Co. "Long-haul" toll calls are passed through this board to the Bell toll board, to be completed by them.

Trunks from the exchange at Bear Creek, Caroline and Marion terminate on line switches in the Clintonville office, and operators at those exchanges are provided with dials, so that they can dial their calls to Clintonville subscribers direct.

Indiana Association to Hold Four District Meetings.

Four district meetings have been scheduled by the Indiana Telephone Association to be held in the state this month and in July. These meetings will take in the northern, southeastern, west central and east central sections of the state.

The Northern Indiana Telephone Association will hold its annual convention at the South Shore Inn, Lake Wawasee, June 24, 25, and 26. Miss Ada Delbridge of Indianapolis, Miss Belle Bernetha and Miss Mary Gould of Rochester, Ind., Miss Ethel Anglin of Leesburg, and Mrs. Carl Bolton of Warsaw are in charge of arrangements for the traffic part of the meeting.

The meeting is expected to be one of the largest and best in the state from point of entertainment, program and attendance. The operators' school will be unusually interesting in that local and night operators will take an active part in the program. The men's sessions will have some very important topics for managers and helpers of both the largest and smallest plants.

The Southeastern Indiana Telephone Association will hold its annual meeting at Clifty Falls State Park, Madison, July 10.

The West Central Indiana Telephone Association has scheduled its meeting at Turkey Run State Park for July 17.

The East Central Indiana Telephone Association will meet at Pendelton on July 23.

All telephone men are invited to attend the district meeting nearest them and enjoy the interesting programs prepared for each convention.

New Cable Between New York City and State Capital.

The first part-underground telephone cable to be installed between New York City and Albany, N. Y., was placed in service Friday, May 30, when three circuits were opened to traffic between the two cities. Other circuits will be placed in operation at frequent intervals until all are in service. The new telephone highway will increase the number of long distance cable circuits between New York and Albany by about 50 per cent. While most of the lines in the new cable will terminate in Albany, many will be through circuits to other parts of the country.

This cable, the fifth and largest to interconnect the metropolis and the state capital, is the first that has yet been drawn into the completed sections of the 150-mile telephone subway being built between the cities to further increase the facilities and dependability of the service. This subway, which is being constructed along the west side of the Hudson, is the first through this part of the state. When completed it will be the second longest subterranean route of its kind in the United States. It is now about two-thirds completed.

The underground parts of the cable are confined to the two sections of the subway which have been finished: the 63-mile stretch from New York City, through northern New Jersey, to Monroe, N. Y., and the 32-mile sector from Albany to Catskill. Although the unfinished section of the subway between Catskill and Monroe by way of Newburgh and Kingston, will not be completed until 1932, overhead cable constructed along this route about a year ago serves as the connecting link between the two underground sections.

Providing from 212 to 340 circuits for commercial purposes and six for radio broadcasting, the new cable brings needed relief to the four other New York-Albany cables, entirely of overhead construction, whose 500 circuits combined have been operating close to capacity to take care of a long distance traffic which has increased about 50 per cent during the past three years.

The construction of the subway began about a year ago, and the placing in its ducts of the new cable began about six months ago. The initial cable, however, marks only the beginning of the utilization of the subway facilities, which, telephone engineers declare, is expected to be adequate to meet the communication needs along this route for more than a decade to come. When completed, the subway will be able to accommodate from 10 to 30 cables, containing millions of miles of wire. During the next five years it is planned to install several other long distance cables in its ducts.

THE OUTSIDE TELEPHONE PLANT ENGINEERING.

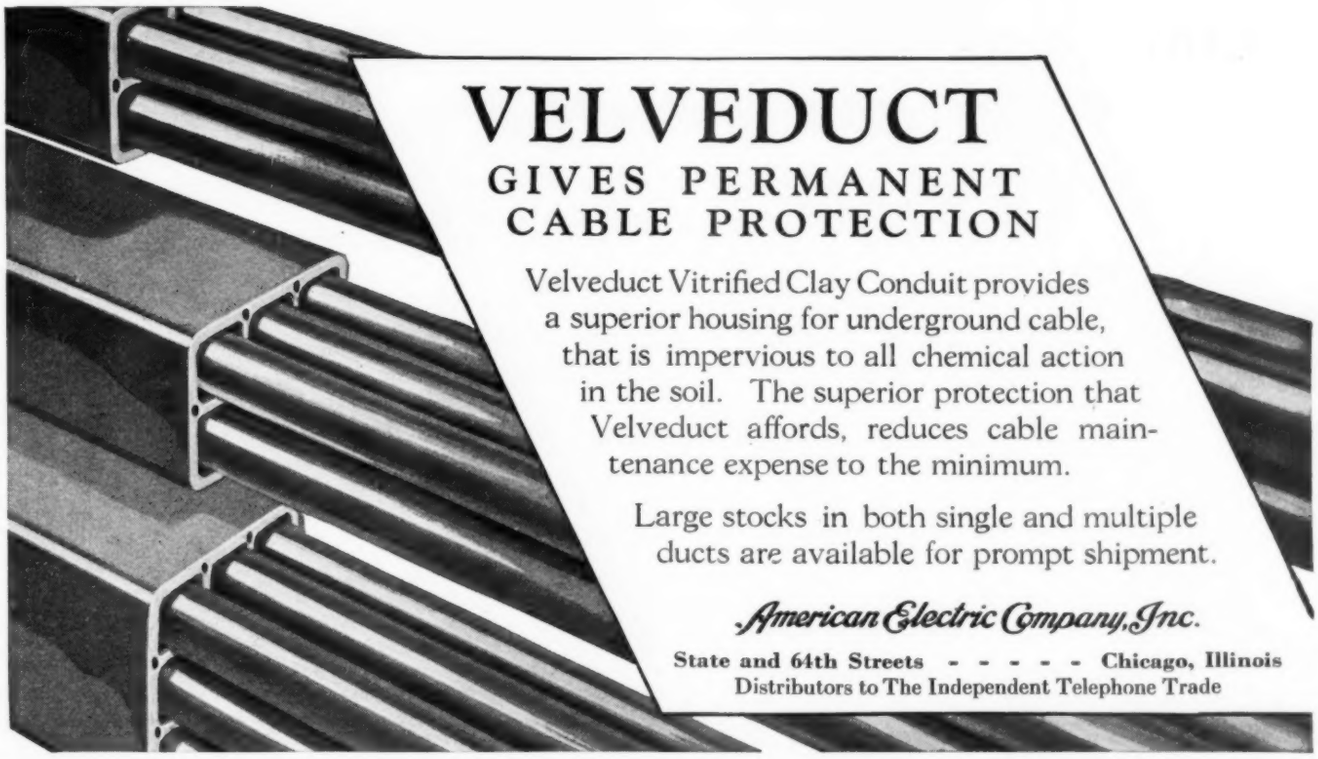
(*Concluded from page* 21.)

mended represent in itself a sound investment? Are the assumptions on which this selection was based well-founded, and do they warrant immediate execution?

It is evident that experience is an important factor in making these decisions, but it should be reasonably clear that any experience cited represents facts, not opinion, and that it is based upon conditions comparable with those under consideration.

Prices in the Metal Markets.

New York, June 2: Copper—Quiet; electrolytic spot and futures, 13c. Iron—Quiet; No. 2 f.o.b. Eastern Pennsylvania, $18.00@19.00; Buffalo, $16.00@16.50; Alabama, $12.00@14.00. Tin—Easy; spot and nearby, $30.75; future, $31.25. Lead—Quiet; spot New York, 5.50c; East St. Louis, 5.40c. Zinc—Quiet; East St. Louis spot and future, 4.62@4.63c.



VELVEDUCT
GIVES PERMANENT CABLE PROTECTION

Velveduct Vitrified Clay Conduit provides a superior housing for underground cable, that is impervious to all chemical action in the soil. The superior protection that Velveduct affords, reduces cable maintenance expense to the minimum.

Large stocks in both single and multiple ducts are available for prompt shipment.

American Electric Company, Inc.

State and 64th Streets - - - - - Chicago, Illinois
Distributors to The Independent Telephone Trade

VELVEDUCT CLAY CONDUIT
Made By
CLAY PRODUCTS COMPANY, Inc., OF INDIANA, BRAZIL, INDIANA

AYER & LORD TIE CO.
INCORPORATED
Railway Exchange
CHICAGO

Railroad Cross Ties — Timber Products — Lumber — Poles

Piling — Fence Posts
Wood Treatments and Preservation

PLANTS

Carbondale, Ill., Grenada, Miss., Louisville, Ky., North Little Rock, Ark., Montgomery, Ala.; Marine Ways-Paducah, Ky.

"CREOSOTE OIL PREVENTS DECAY"

Suttle Equipment Co.
FACTORY AND MAIN OFFICE
Lawrenceville, Illinois

Window Envelopes

Just the thing for your monthly subscriber bills. The window is cut so the name shows through, and saves addressing the envelopes. Regular 6¾-inch size, high quality Manila envelope. With your name and address printed in the corner.

500	$ 2.75
1000	4.00
2000	7.00
5000	15.00

SEND FOR SAMPLES

Suttle Equipment Company,
Lawrenceville, Illinois.

Please send me samples of window envelopes.

Name .....

Address .....

Mgr. .....

It is a mark of distinction to say, "I saw it in TELEPHONY."

Small Virginia Town's Modern Service

Old-Type Magneto Switchboard with Ten Line Circuits Installed at Lorton, Va., in 1904 Retired From Service—Some Interesting Points of Old Board—Description of New Magneto Board of Modern Design Which Was Installed

By A. W. Schell,
Sales Representative, Kellogg Switchboard & Supply Co.

According to the 1920 census, a population of only 152 people support the town of Lorton, Va. Lorton is located in Fairfax county and has many historic places of interest. It is located approximately eight miles north of Mount Vernon, the homestead of George Washington. The Betty Custis home is located in the immediate vicinity.

Every year many people go to Lorton to visit the Episcopal church that was originally erected by George Washington and John Mason prior to the Revolutionary War. This old church is situated on the Washington-Richmond highway.

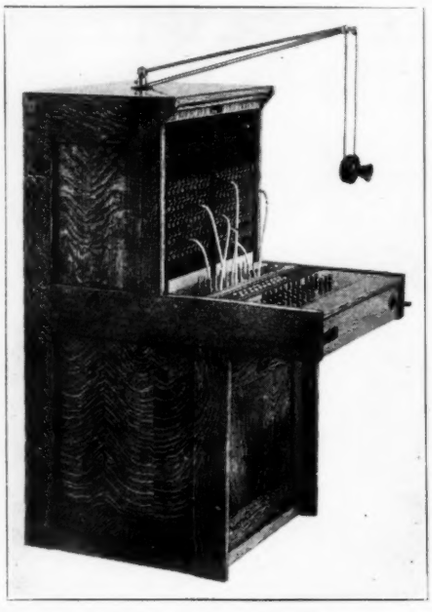
Old Kellogg Magneto Switchboard Built in 1904 and Just Retired from Service in Lorton, Va., Exchange.

About one year ago, the Lorton Telephone Co. installed a new, up-to-date Kellogg floor type magneto switchboard. A view of the old Kellogg magneto type board that was removed from service is shown in one of the illustrations.

As a bit of telephone history, it is interesting to note some of the details of the old board. It was built in 1904 and equipped with ten line circuits and five single-drop supervisory cord circuits for setting up connections, with one operator's cord for completing calls. Additional capacity was provided for another ten lines of the same type.

The small cabinet containing the hand generator has five ringing keys associated with the connecting cord pairs. The cord circuits used were of the single-drop supervision type, each circuit provided with a jack under the clearout drop. A single cord and plug could be inserted in the jacks to connect the operator's telephone to any desired cord circuit.

The row of five push buttons in the generator box was for the purpose of furnishing a selective ringing system. The ringing was operated from the hand generator and designed to furnish positive and negative pulsating currents on either side of the line to ground, and grounded alternating current.



New Floor-Type Kellogg Magneto Switchboard Installed at Lorton, Va., Replacing the Wall-Type Board.

The board was originally equipped with a transmitter arm and transmitter, which apparently had been removed when the board was retired from service and before the photograph was taken.

It is especially worthy of note that the battery cabinet shown beneath the drops and jacks, is of a type designed to hold the wet type zinc and salammoniac batteries or the copper-bluestone cells.

The new Kellogg board has a reputation for speed, reliability and accuracy in operating, as well as for the wearing quality of its mechanical construction. It is of the low keyshelf type. The board is wired for an ultimate capacity of 150 lines and 15 cord circuits, and is equipped with 40 line circuits and 10 double-lamp supervisory cord circuits with repeating coils.

The auxiliary circuits and equipment consist of one operator's set, one complete generator circuit with switching key for reverting power ringing when desired, and one complete common night alarm and pilot alarm circuit.

The cabinet is designed to provide the most equipment in a minimum of space. It can be equipped with any given number of lines and cord circuits as required, up to its total capacity. The height of the keyshelf provides for easy operation from a chair of ordinary height, which allows of the operator working in comfort.

The new type Kellogg magneto switchboard gives the citizens of Lorton, Va., the satisfaction of modern service in keeping with the times.

New York City P. B. X. Operators Outnumber Company's.

More operators are required to attend the 35,300 private branch switchboards serving business firms in New York City than are employed by the New York Telephone Co. in its 182 central offices in the same area. Half of the 953,000 telephones in Manhattan are served through these private branch exchanges. The majority of the big buildings have at least one and oftentimes many more P. B. X. switchboards serving the tenants.

These branch telephone offices range in size from the small cordless type, of which there are 21,300, to the larger, cord-type boards of which there are 14,000. The number of girls required to operate these boards varies from one to 42. The largest private branch exchange in the world is that of the Consolidated Gas Co. which has 42 positions—as large as a central office serving a community of 50,000 people.

Telephone Link of Japanese Islands to Be Completed by July.

In keeping with government policy to unite the units of the Japanese island empire by radio and airplane, wireless telephone will connect the main islands with the southern colony of Formosa by July, a recent Associated Press dispatch states.

BRIGHT STAR

Supreme in Every Test

"BAG TYPE" DRY CELLS

are recognized by

Leading Telephone Engineers

as the only dry cell for

Telephone circuits

For convenience in transporting batteries to your stations and for facilitating installation, we recommend the BRIGHT STAR handy package of 3 at no extra cost.

We guarantee these Dry Cell Telephone Batteries to *outlast any competitive dry cells of their size.*

We supply over 500 Independent Telephone Companies in this country. Telephone engineers are invited to write for a sample cell for test.

BRIGHT STAR BATTERY CO.

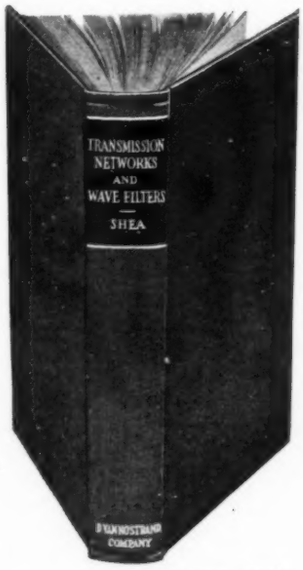
Chicago HOBOKEN, N. J. San Francisco

TRANSMISSION NETWORKS AND WAVE FILTERS

By

T. E. SHEA, B. S., M. S.

Member of the Technical Staff, Bell Telephone Laboratories



The calculation and design of telephone networks and wave filters are fully presented in this book, written by Mr. T. E. Shea of Bell Telephone Laboratories. It embodies the most recent developments in this field as well as the standard practice.

"The Telephone Equipment of 1929," "The New Science Telephony," "Transmission Networks and Wave Filters" and "Radio Broadcasting Engineering" are a few of the subjects capably discussed in this valuable book.

SEND FOR THIS BOOK TODAY!

We recommend it as of great interest and value to every telephone man. 512 pages—6¼ x 9¼—Cloth—Illustrated—$6.50.

TELEPHONY PUBLISHING CORPORATION

608 S. Dearborn St. Chicago, Ill.

. Abolish the inefficient stencil, pot and brush.

USE

PREMAX

ALUMINUM

MARKERS

Faster Marking, Greater Visibility, Last a Lifetime

TELEPHONE companies all over the country have discarded the messy, unsatisfactory stencil system of marking poles, cable terminals, terminal boxes, and other properties, and now use Premax Markers.

They found, by test, that Premax Markers provided advantages which drove the old method into obsolescence. Premax Markers are easier to use, far more legible, are immune to the effects of weather, never need attention or replacement, and their first cost is extremely nominal.

Premax Markers appeal, instantly, to any telephone company official interested in more efficient and more economical property marking. They are made in sizes, types, and symbols for every marking need.

The entire subject is completely covered in the Premax Book on Property Marking. Use the coupon today.

PREMAX PRODUCTS, Inc.
238 10th St., Niagara Falls, N. Y.

Send for Free Book on Property Marking

PREMAX PRODUCTS, Inc.,
238 10th St., Niagara Falls, N. Y.

Please send a copy of Property Marking Systems for Public Utilities to—

Name .....

Company .....

Address .....

What the Commissions Are Doing

Up-to-the-Minute News Regarding the Activities of State and Interstate Commissions, Courts and City Councils in Matters Concerning Telephone Companies—Summary of Commission Orders and Schedule of Telephone Hearings

Supplemental Report Filed by Master in Michigan Bell Case.

Making relatively unimportant changes in his original report of Michigan Bell Telephone Co. values and rate-finding requirements, William S. Sayres, Jr., special master in chancery, filed a supplemental statement with the federal district court in Detroit on May 7. The supplemental report was the result of a review of exceptions taken to the original document by the telephone company and the defendants, which were the state of Michigan, the city of Detroit and several other municipalities.

The original report found the earnings of the company were insufficient for a fair return on its physical property value, if such return were to be 7 per cent. The master set up an annual deficit of $3,070,430 on the basis of present rates. In his revised figures, he computed the deficit as $3,032,082.

This revision was a result of changes in the establishment of "a fair value for a rate base," which was objected to in the original form by the defendants, and in an alteration of the depreciation figures.

The determination that the telephone company is operating so as to develop an annual deficit of more than $3,000,000 yearly, if confirmed by order of the court, Judge Charles C. Simons sitting, presages an increase in rates over the state. There are approximately 700,000 telephones in the state.

If the deficit were to be divided equally among those telephones, the yearly increase in the individual rate would average slightly more than $4. The original report of Master in Chancery Sayres insisted that the Detroit or the metropolitan telephone district could not be separated from the rest of the state, as the defendants had argued should be done, in matters of rate fixing.

Relative to the question as to whether Michigan Bell Telephone Co. payments to the American Telephone & Telegraph Co. are proper, and should be considered a reasonable charge against earnings in the computing of values for rate findings, Master in Chancery Sayres said:

"It may be added that, as the record now stands, it fairly appears therefrom that the amount paid by plaintiff for said services does not exceed their reasonable value."

The master fixed $150,509,525 as the total average fair value of the company for purposes of rate fixing; that $10,535,667 is required annually for the payment of a 7 per cent annual return on the investment; and that after a check of revenues and operating expenses, there are only $7,503,585 available for an annual return, leaving an annual deficit of $3,032,082.

Final Hearing of Appeal in Terre Haute, Ind., Case.

The final hearing of the appeal in the rate case of the Citizens Independent Telephone Co., Terre Haute, Ind., has been set for June 20 by Judge Lineus Evans in Superior Court No. 2. Rulings of the court in previous hearings include the sustaining of a demurrer of the state commission and the company to the motions of the city for a judgment pro confesso, a temporary injunction to prevent the collecting of the increase in rates by the company and to order the impounding of the excess rate collected until the case is finally decided.

Judge Evans declared the present rates are now the only legal rates, they having been fixed under provisions of the law and that they would remain such until otherwise ordered by the court. The company's counsel contends that even if the case is decided adversely to the company, the rates collected, until such a decision is rendered, will remain the property of the company as the subscribers could not have returned to them the excess now being collected for the very reason that the judge had given—that they now are the legal rates.

Michigan Commission Orders Appraisal in Muskegon Case.

The Michigan Public Utilities Commission has granted the petitions of the three cities of Greater Muskegon for a high-spot appraisal of the properties of the Michigan Home Telephone Co. of Muskegon, and an audit of the books. Work will be started at once by the engineers and auditors of the commission.

The petition asking for the appraisal and audit was made by the cities following the application for an increase in rates by the telephone company. The representatives of the three municipalities meeting as a committee decided on this course after several conferences with the officials of the telephone company.

Robert H. Dunn, chairman of the commission, explained that there had been delay in considering the petition of the cities because of the press of similar work, and also due to the fact that sickness had decreased the working force.

As soon as the appraisal and audit are completed, the state commission will set a date for hearing on the application of the company for its increase in rates. The representatives of the cities decided that they were in no position to discuss the rate question unless there was an audit and appraisal made.

The company contends that it is receiving only 3.76 per cent return on its present investment of $1,595,729. It seeks a return of near 8 per cent on that investment. The new schedule of rates as proposed would provide an increase from $48 to $72 a year on private business telephones and from $30 to $36 on a private residence telephone. In other words, the increase proposed ranges from $24 a year on business telephones to a $4 a year increase on a four-party residence telephone.

The representatives of the cities urged that the question of long distance toll revenue be considered in connection with the revenue of the company.

Nebraska Commissioner Tells Policy in Deciding Cases.

A partial hearing of the application of the Lincoln Telephone & Telegraph Co. for an increase of rates at its Hastings and affiliated exchanges was given recently by the Nebraska State Railway Commission. S. B. Lyman, former owner of the local plant, retained by the chamber of commerce to resist the application, asked for further time to investigate matters.

He said that a tornado that visited Hastings some weeks before had taken so much of the time and energies of citizens that he had not been able to complete his inquiries. He insisted that the wide difference between the taxable value of the company's property and the value claimed for rate-making purposes indicated that no increase in rates was needed. He also complained that the expense account showed a heavy increase last year, and he wished to examine the records for the reason.

Commissioner Randall ordered the hearing to proceed, but said that the protestants would be given several weeks to prepare their case and meanwhile will be given access to all exhibits and records.

At the beginning Mr. Randall said that never before in the history of the commission had there been so much advance comment on the commission, and threats had been made through one of the newspapers and by mail that were intended to coerce the judgment of the commissioners.

He said that he wished to give notice that the commission would decide this

case, as it did all other rate cases, on the evidence and the law. He said he had lived 40 years in the state, and he defied anyone to point to any dishonest act on his part.

J. H. Agee, general manager of the company, presented exhibits showing that the net earnings of the company have been below a reasonable return for a number of years. These showed: 1920, 2.63 per cent; 1921, 4.27 per cent; 1922, 5.89 per cent; while last year they were neglible. For the first four months of this year the accounts are in the red.

He said that when the company bought the competing plants of the Bell and local Independent company in 1913, they had a joint value of $373,314. Additions and betterments made since then, less salvage, leave the company with a present investment of $580,174. In computing the revenues, 25 per cent of the toll business is credited to the exchange.

Mr. Agee presented figures showing that if the number of telephone connections now available are to be considered, the new rates are lower than existed when the company bought the local corporation's property. In addition, he pointed out that then a business man had to have a telephone connected with each of the two competing exchanges, paying a total sum of $6.50, where now, with many more telephones available, he will pay but $6.00.

Expenses of operation have been steadily increasing. The company is not extravagant in the payment of salaries and wages, but it must pay whatever competition for skilled workers compels in the labor market. The pay of cashiers has gone up from $55 a month to $95; stenographers from $25 and $40 to $75 and $90; wire chiefs from $80 a month to $190; foremen, from $100 a month to $170; cable splicers from $3.75 a day to $6.00; and operators, 31 in number at present, formerly paid $20 and $37.50 now draw an average of $57.60 a month.

The testimony taken is being transcribed for the use of Mr. Lyman, and he will be given ten days' notice when a final hearing will be held. Although considerable uproar had been made locally by a weekly newspaper and protests made from several sources, there were but a hundred persons present when the hearing began, and these stayed only a short time. The hearing was marked by courtesy and fairness on both sides.

Figures presented by I. J. Devoe, auditor of the company, showed that when the reconstruction is finished, the company will have invested in the area in excess of $640,000. The new rates will increase gross revenues from $141,391 to $168,919, which will enable the company to earn 5.73 per cent upon the actual value.

Mr. Lyman questioned the increase in repairs from $27,886 in 1928 to $42,209 in 1929, but company witnesses said that it

THIS MAN'S TIME MEANS MONEY

NATIONAL SLEEVES SAVE TIME

National Double Tube Sleeves Sizes 17 B & S to 4/0 B & S Strand

TODAY time is recognized as the "fourth dimension of business." Everywhere, in all departments, telephone companies are seeking, accepting, and putting in use all practical, efficient, economical methods that will cut labor time, and decrease distribution costs.

National Splicing Sleeves are in use today by the largest telephone companies in all parts of the world, because they are time savers. Not only do they save time in the making of the original splices, but because of their strength and durability, they eliminate all line breaks at the joints where National Splicing Sleeves were used, thus doing away with the trouble of repair work at these points.

National Sleeve Splices are quickly made. They are stronger than the wire itself and have a conductivity of better than two to one, and best of all every line joint made with National Sleeve Splices is uniform with every other.

Send today for samples, prices, and full information

The NATIONAL TELEPHONE SUPPLY COMPANY

5100 Superior Ave. **Cleveland, Ohio**

is the practice to permit an accumulation of repairs with the result that every three or four years a bulge is shown. H. H. Wheeler, Jr., chief engineer, said the property had been reappraised; that the reproduction new value is $838,118 and depreciated value $746,809.

Asks Nebraska Commission for Increase with Improved Service.

The Lincoln Telephone & Telegraph Co. has applied to the Nebraska State Railway Commission for authority to increase its rates at its Table Rock exchange. The schedule proposed is $3 a month for business, $2 for individual residence and $1.75 for two-party residence service.

The company is planning to make this exchange, as it has others in the southeastern part of the state, metallic instead of grounded magneto, and has found that subscribers heartily cooperate with it in the improvement of service. Eighty per cent of the patrons have filed a statement with the commission that they desire the better service, and are willing to pay standard rates.

New York Commission Suspends Rate Schedule; to Investigate.

The New York Public Service Commission on May 26 directed that the new rates filed with it by the Black River Telephone Co., effective May 1 and covering the Lake Brantingham territory, be suspended for a period of 90 days unless the commission shall otherwise order before the expiration of that period. A complaint against the new rates was recently filed with the commission by Leon Graves, Gilbert M. Wantz and Maurice Buckley, hotel proprietors in the vicinity of Lake Brantingham.

For several years the telephones in this locality have been connected with the Lowville exchange. The telephones have been on a rating of 15 cents per call to Lowville. No charge for the telephones has been made except the actual toll charge on each call. Coin boxes were also used in the hotels.

Under the new schedule a rental of $9 per annum for each coin box is provided in addition to a guarantee of revenue from local messages equal to the minimum business rate for the class of service installed within the particular area. A mileage charge at the usual rates prevails. The commission will hold a hearing in the matter before any further action is taken.

Sale to Bring Improved Service in New York Resort Area.

The Otsego & Delaware Telephone Co. of Oneonta, N. Y., has secured approval of the Interstate Commerce Commission to purchase the properties of the Rose Telephone Co. of Hobart. The Rose company serves 1,259 subscriber stations from four exchanges and has 55 pole miles of toll lines, the area covered comprising about 300 square miles, located near Albany, N. Y. There is no duplication of plant or service. The purchase price is $155,000, as of March 10, 1930.

An appraisal made by the plant superintendent of the Otsego company finds the reproduction cost of the properties to be $246,476.55, and less depreciation, $151,737.15. In 1929, the operating expenses of the Rose company were $33,191.90, and the operating revenues were $49,890.20. There are many hotels and boarding houses in the section served by the Rose company, which are patronized largely by summer vacationists from New York City and the metropolitan area, and a large amount of equipment is necessary to handle the toll traffic during the seasonal period.

An estimated investment of $70,000 within the next five years will be required to provide local facilities in the small hotels and boarding houses, the number of which is increasing rapidly, together with additional switchboard and toll line equipment. The Otsego & Delaware company, which is one of the Bell group of companies, the commission's report states, is in position to finance the plant extensions necessary to furnish satisfactory service in this section.

Increased Rates Authorized by Oklahoma Commission.

The Southwestern States Telephone Co. has been authorized, effective June 1, 1930, to put into effect the following telephone rates in Asher, Okla.:

Business desk telephone, $3.00 per month; business wall telephone, $2.75 per month; residence desk telephone, $1.75 per month; residence wall telephone, $1.50 per month; rural company-owned telephone, $1.25 per month; rural company-owned where subscriber owns telephone set, $1.00 per month; rural switched, 50 cents per month; oil field service, special rates as justified by investment necessary in building from initial rate area.

The old rates at Asher were: $2.25 per month for business telephones; $1.25 for residence telephones; 25 cents per month extra for desk sets.

The company has reconstructed the exchange and put it into condition to give excellent service. The commission concluded from the evidence that the old rates were insufficient to bring a fair return on the value of the plant, which is found to be $10,314.

Removes Discrimination by Eliminating Free Exchange Service.

The Oklahoma Corporation Commission has granted the applications of the Western Telephone Corp. of Oklahoma and the Standard Telephone Corp. of Texas for discontinuance of free tele-

Now Standard in the telephone Industry < < <

SINCE WALL SUPERIOR PRODUCTS 1864

Of brazed steel construction throughout. Its patented burner is self-cleaning, hotter by several hundred degrees, and so protected that continuous operation is assured in the coldest, windy weather, making this torch particularly fine for use in exposed locations. Sturdy, reliable, safe—try a DREADNAUGHT No. 41 on your hardest work. It will be a revelation.

Cat. No.	Description	Tank cap., qt.	Shipping wt. per doz., lb.	List Price	
				Each	Dozen
41	For gasoline	1	62	$ 7.00	$84.00
42	For kerosene	1	62	8.00	96.00

P. Wall Mfg. Supply Co., 3126-66 Preble Ave., N. S., Pittsburgh, Pa.

DREADNAUGHT

"SERVICE WITH SAFETY" **BLOW TORCHES**

phone service from Goodwell to Texhoma and provided for routing such messages over the copper circuit owned by the Western Telephone Corp. of Oklahoma.

The applicants were authorized to charge the standard toll rate now in effect for similar service within the state. The two companies are joint owners of a grounded iron circuit between Texhoma and Goodwell. Calls passing over the line from Texhoma have been charged for as toll messages, and calls originating and passing over that line from Goodwell in Texhoma have been transmitted free.

The commission decided that this situation constituted a discrimination and that better service could be obtained by a uniform toll charge in each direction to be routed over the copper toll circuit.

Summary of Commission Rulings and Schedule of Hearings.

INTERSTATE COMMERCE COMMISSION.

May 21: The acquisition by the Otsego & Delaware Telephone Co., Oneonta, N. Y., of properties of the Rose Telephone Co., Hobart, N. Y., approved.

June 6: Hearing at Washington, D. C., in the matter of the joint application of the New Jersey Bell Telephone Co. and the Egg Harbor City Telephone Co. for authority to the New Jersey company to acquire the properties of the Egg Harbor City company, the latter serving approximately 600 stations. The purchase price is $70,000.

ALABAMA.

June 12: Hearing at Montgomery on the petition of P. A. Holton for the approval of the purchase by him of the Coffeeville Telephone Exchange from Lester Deas. Hearing was postponed from June 2 to this date.

ILLINOIS.

May 22: Automatic Home Telephone Co. of Pontiac authorized to make effective a new rate for eight-party rural automatic service outside the initial rate area but within the exchange area. The rate is optional and the new service is stated to be an improvement over the present rural service. The schedule, which is effective June 1, calls for a rate of $3 a month for business stations and $2 a month for residence stations within three miles of the central office plus 25 cents a month for each additional two miles or fraction thereof.

June 3: Hearing at Springfield before Commissioner Collins concerning complaint of the city of Shelbyville against the Illinois Southeastern Telephone Co. as to toll charges, contrary to the provisions of its charter in Shelbyville.

June 4: Hearing at Springfield before Commissioner Gilbert in the matter of the proposed advance in rates for service at Vandalia filed by the Illinois Bell Telephone Co., stated in rate schedule I. C. C. 2, of the company.

June 4: Hearing at Springfield in the matter of an application by the Corn Belt Telephone Co., for an order making permanent the present increase of 25 cents per station per month for telephone service; petition filed by McLean, Saybrook, Belleflower, Atlanta, Downs, Heyworth, Armington and LeRoy, for reconsideration of order granted by commission and cases set for further hearing.

INDIANA.

May 19: The Winona Telephone Co. at Plymouth given permission to abandon its

WB Rubber Covered WB
TELEPHONE WIRE

Standard and Specification Grades furnished by

GraybaR

"There's a Graybar House near you"

The Whitney Blake Company

MANUFACTURERS

International Standard Electric Corporation
FOREIGN DISTRIBUTORS

Western Electric Company, Inc.
BELL SYSTEM DISTRIBUTORS

New Business

Is your exchange making the most of every new demand for service? Many companies conduct campaigns which increase their stations substantially. New extensions are added which bring revenue without tying up outside plant. These are problems of management.

Our Public Utilities Department is prepared to offer advice and counsel on all of the subjects listed below. Clip this ad and check the subjects which interest you.

Public Utilities Department

The United Trust Company
ABILENE, KANSAS

Advertising ☐	Appraisals ☐	Bookkeeping ☐
Engineering ☐	Finance and Taxes ☐	Management ☐
Operations ☐	Publicity ☐	Public Relations ☐

Name .....

Address .....

Firm Name .....

Penote "Universal" Manhole Forms▲▲ Usable Over and Over Again ▲▲Cut Manhole Construc-▲▲tion Expense▲▲

HERE'S a sectional manhole form, built of husky steel, that is practically indestructible, assuring you service over a long period of years.

"Universal" Forms are quickly and easily set up in the excavation and removed from the finished manhole, and the instant a "Universal" form is set up you can begin pouring concrete, and continue until the entire manhole is completed.

Penote "Universal" Forms are designed especially to meet telephone company requirements. With one set of these adaptable forms you can build a variety of sizes of manholes.

Penote Forms are not expensive. Experience has shown that the savings found in the construction of from six to ten manholes will pay for a set of Penote "Universal" Forms that assure you a smoother, more finished installation.

Write for catalog No. 10, giving full information and specifications.

THE CLEVELAND TRENCHER COMPANY
20100 St. Clair Ave.
Cleveland, Ohio

exchange at Tyner. Patrons of the Tyner exchange will be served from either Plymouth or Walkerton at the rates now in effect.

KANSAS.

May 21: E. C. Ruch applied for permission to sell his telephone plant at Claflin to the Western Telephone Corp.

May 21: Bert Bradley asked approval of the sale of his exchange and plant at Benedict to the Kansas Home Telephone Co.

May 21: Kansas Home Telephone Co., which has purchased the Farmers Mutual Telephone Exchange at Altamont, applied for a certificate of convenience and necessity to enable it to operate in Altamont.

MICHIGAN.

May 9: Petition granted of city of Muskegon for a high-spot appraisal of the properties of the Michigan Home Telephone Co. of Muskegon and an audit of the books.

MINNESOTA.

June 10: Adjourned hearing at St. Paul in the matter of the petition of the Western Buse Telephone Co., the Swan Lake Telephone Co., Lines 11 and 13, Fergus Falls Rural Telephone Co., Excelsior Rural Telephone Co., French Rural Telephone Co., Hoot Lake Telephone Co., Horseshoe Lake Telephone Co. and Red River Rural Telephone Co.

NEW YORK.

May 26: Commission directed that new rates proposed to be made effective by the Keeseville Telephone Co. on June 1, be suspended for 90 days, unless the commission shall otherwise order before the expiration of that period. The new rates would apply to the Ausable Forks, Keeseville and Upper Jay central office districts. While there would be no change in business or residence individual line service, there would be an increase of 50 cents per month in other classes of service, both residence and business. The commission will hold a hearing in the matter before any further action is taken.

May 26: Schedule of new rates filed by the Black River Telephone Co., effective May 1 and covering the Lake Brantingham territory suspended for a period of 90 days, during which the commission will hold a hearing.

MISSOURI

May 28: The Middle States Utilities Co. of Mo. granted permission to amend rate schedule for service at its Bethany exchange, effective June 1, to remain in force until the commission has completed the valuation. A further hearing will be held to fix a justifiable rate base.

OKLAHOMA.

May 22: Application granted of the Western Telephone Corp. of Oklahoma and Standard Telephone Corp. of Texas for discontinuance of free service from Goodwell to Texhoma.

May 22: Southwestern States Telephone Co. authorized to increase its rates in Asher, effective June 1.

June 3: Hearing on application of the United Telephone Corp. for increase in rates at Watonga.

June 4: Hearing in matter of Chamber of Commerce of Quinton vs. Standard Telephone Co. for adjustment of rates in Quinton.

WISCONSIN.

June 3: Hearing held at Mason on application of North Wisconsin Telephone Co. to increase rates.

Condensed Telephone News

Companies Are Urgently Requested to Forward to Us Promptly News Concerning Construction, Rebuilding, Financing, Election of Officers, Sales and Purchases of Exchanges or Other Activities

New Incorporations and New Telephone Companies.

INDIANAPOLIS, IND.—Articles of incorporation have been filed with the secretary of state by the United States Investment Corp., having a principal place of business in Indianapolis. The corporation has an initial capital stock of 9,569 shares with a declared par value of $100 each, and 5,000 shares having no declared par value. It is formed "to issue on commission, subscribe for, acquire, hold, sell exchange and deal in shares, stocks, bonds, obligations or securities of any public or private corporation, government or municipality." The first board of directors is composed of Max F. Hosea, well-known telephone operator in Indiana, John T. Detchon and A. J. Roberts.

DES MOINES, IOWA—The Britt & Crystal Telephone Co., of Crystal Lake, has been incorporated with a capital of $6,000. A. O. Christianson of Crystal Lake is president and E. H. Olsen of Britt is secretary.

BRITTON, MICH.—Articles of association of the Britton Telephone Co., organized April 30, have been filed. The new company is capitalized at $5,000, of which $2,360 has been subscribed and paid in. The capitalization is 500 shares of par value of $10. The directors are Charles R. Craig, Charles Spohr, John Gittus, George F. Putnam and Joseph Wiggins.

ELLIS, S. D.—Articles of incorporation have been filed for the Vincent-Bethel Telephone Co. to manage a telephone system here, with a capital of $5,000. Incorporators are W. A. Vincent, E. W. Allen, Harold Foster, M. C. Phillips, and Ray C. Hyde, all of Ellis.

Financial.

CHICAGO, ILL.—A dividend of $2 a share was declared on May 28 by the board of directors of Illinois Bell Telephone Co. It is payable June 30, 1930, to stockholders of record on June 28, 1930.

Franchises.

WEST BRANCH, IOWA—The West Branch Telephone Co. has been granted a renewal of its franchise for a period of 25 years through an ordinance passed by the town council permitting the necessary placing of poles, etc., and streets and alleys. Several thousand dollars worth of material has been ordered which will be used in placing underground cables. Conduits have already been laid.

Construction.

PIGGOTT, ARK.—The Southwest Telephone Co., with headquarters in Dallas, Texas, has installed a new switchboard in its office at Piggott.

CHICAGO, ILL.—At its meeting, May 28, the board of directors of the Illinois Bell Telephone Co. approved an expenditure of $547,992 for new plant in Chicago and $520,288 for Illinois outside of Chicago, making a total of $1,068,280. The total approved for this year is $10,450,404.

SHELBYVILLE, ILL.—The Illinois Southeastern Telephone Co., with headquarters

in Mattoon, is constructing two new toll lines between Shelbyville and Pana. When the lines are completed the company will have two additional copper circuits between these places.

TOPEKA, KANS.—Operating subsidiaries of Associated Telephone Utilities Co. have increased their 1930 development program in Kansas to approximately $22,729 through the addition of improvements to the company's properties in this state.

In Kansas improvements to service in central offices and exchanges will cost $16,741, while intercity and rural betterments will total $4,587.

WHITEFISH, MONT.—The Mountain States Power Co. will expend $40,000 to install new automatic service at Whitefish, according to A. P. Tills, local manager. Equipment has been ordered.

NEW YORK, N. Y.—The board of directors of the New York Telephone Co. authorized the expenditure of $3,928,645 for new construction throughout the state at a meeting held May 28, according to an announcement made by J. S. McCulloh, president. The amount appropriated since the beginning of the year now totals $50,220,815, of which $42,340,765 has provided for the extension of facilities in the New York City metropolitan area.

Miscellaneous.

MONMOUTH, ILL.—A recent transfer of property of the Illinois Northern Telephone Co. has necessitated changing the name of the company to the Illinois Commercial Telephone Co. The Illinois Commercial Telephone Co. is the Illinois operating unit of the Associated Telephone Utilities Co., of Madison, Wis.

ELKHART, IND.—Norman E. Swanson, secretary-treasurer of the Home Telephone Co. of Elkhart County, Elkhart, has confirmed a rumor that an office of the Associated Telephone Utilities Co., of which the Home is a subsidiary, is to be established in the Goshen, Ind., building of the Home company. He said that when fully developed, the office will employ 50 or more persons.

This division will be the revenue accounting department of the Associated company to bill out the monthly statements of about 70 exchanges in the states of Indiana, Ohio and Michigan, and possibly other states as the plan develops. Since the first change in the ownership of the Home company a couple of years ago, Elkhart and Goshen subscribers have been receiving their monthly bills from the revenue accounting department at Newton, Iowa.

The Home building at Goshen has much floor space that is not required by the Goshen exchange. The building originally was a palatial residence and has been remodeled for exchange and office duties.

PETERSBURG, IND.—The Pike County Telephone Co. has changed its name to that of Mid-West Telephone & Utilities Co., Inc., under the laws of 1929, which has been approved by Secretary of State Otto Fifeld. There has been no change in officers. Carol Thomas is president; Carl M. Gray, secretary; and L. L. Dearing, treasurer.

PRESCOTT, IOWA—Jack Sparr of Prescott was recently appointed receiver of the Prescott Mutual Telephone Co. During January of this year, administrators of Thomas Hubatka's estate were awarded a judgment of $5,250 damages against the Prescott Telephone Co., it being claimed the death of Mr. Hubatka was caused by the negligence of the company in maintaining a wire across a certain intersection a few miles north of Prescott.

ALTON BATTERIES

ARE IN USE IN

GRENADA
INDIA
ITALY
MALAYA
MALTA
MANCHURIA
NEW ZEALAND
NYASALAND
PERU
PORTUGAL

AND OTHER COUNTRIES

ALTON THE BATTERY COMPANY LTD ALTON HANTS

Cables:—BATTERY, ALTON, ENGLAND
Codes:—6th Ed., A B C and BENTLEY'S

Representatives in Australia:
MESSRS. AUTOMATIC TELEPHONES, LTD., SYDNEY

RUNZEL-LENZ ELECTRIC MFG. CO.
ESTABLISHED 1904 CHICAGO

Specializing in Manufacture of

CORDS

FOR ALL CLASSES OF TELEPHONE WORK

EVER-PROTECT CABLE COMPOUND
EFFECTIVE *in maintaining your underground and aerial cable in perfect condition*
NATIONAL CABLE COMPOUND CO.
MITCHELL INC. INDIANA

TELEPHONY ADVERTISERS
will give you service
which will be
pleasing

Blake Insulated Staples
Trade Mark

Unequalled for telephone and bell wiring. The fibre insulation prevents troublesome short circuits and grounds.

4 Sizes. Pat. Nov. 1900

Write for samples

Blake Signal & Mfg. Co.
BOSTON, MASS.

It is a mark of distinction to say, "I saw it in TELEPHONY."

Valuation—Supervision—Plant—Inductive Interference
Expert Administrative Counsel for Utilities
JAY G. MITCHELL
TELEPHONE ENGINEER
Member A. I. E. E.
Member W. S. E.
1509 South Park Ave., Springfield, Ill.

Frank F. Fowle & Co.
Electrical and Mechanical
ENGINEERS
Monadnock Building CHICAGO

COFFEY SYSTEM & AUDIT CO.
CERTIFIED PUBLIC ACCOUNTANTS
CONSOLIDATED BLDG. INDIANAPOLIS
Let us keep your books in our office
—All but Subscribers' Ledger—
Write for information and cost

CONSULTING
Telephone Engineer
GARRISON BABCOCK
Tel. E. L. 3149 503 White Building
SEATTLE WASHINGTON

J. K. JOHNSTON TELEPHONE JK ENGINEER INDIANAPOLIS
During recent years I have been privileged to appraise Telephone Exchanges all over the United States. The list totals 750. Would you like to avail yourself of my services?
1035-6 Lemcke Building

CONSULTING TELEPHONE ENGINEERS
W. C. POLK J. W. WOPAT
Plans, Estimates and Reports,
Appraisal and Supervision
Can arrange a moderate amount of financing
406 W. 34th St. Kansas City, Mo.

W. H. CRUMB
Telephone Engineer
9 South Clinton St. Chicago

SPOONER & MERRILL, Inc.
CONSULTING ENGINEERS
Specialists in Public Utilities
TELEPHONE - ELECTRIC - GAS
WATER - RAILWAY
Valuation—Examinations—Engineering
CHICAGO, ILLINOIS
20 No. Wacker Drive

J. G. WRAY & CO.
Telephone Engineers
Specialists in Appraisals, Rate Surveys, Financial Investigations, Organization, and Operation of Telephone Companies
J. G. Wray, Fellow A. I. E. E.
Cyrus G. Hill
2130 Bankers Bldg., Chicago

It is reported that a new corporation is being organized at Prescott for the purpose of either buying the old company's property or constructing an entirely new equipment.

BRAZITO, MO.—The Brazito Farmers Telephone Co. was organized two years ago, at the same time building a four-room bungalow to house the enterprise. Since that time, the company has been very well managed and now has 173 telephones in use, 20 field lines, three individual drop lines and six commercial lines connecting Jefferson City, Lohman, Russellville, Eugene, Henley and St. Thomas. An all-time service is given patrons of the exchange.

Up to this time the rate has been $1.65 per quarter per telephone to pay off the cost of organizing the company, but now the rate has been reduced to $1 per quarter, or 25 cents per month for service.

FAIRFAX OKLA.—The Oklahoma Telephone Co. is negotiating with the Fairfax Chamber of Commerce and the city officials relative to the installation of an automatic telephone system, similar to the system now in service at Broken Arrow, Okla.

At the present time the prospects are most favorable for a satisfactory agreement.

HARRISBURG, PA.—The Cumberland Valley Telephone Co. of Pa. held its annual stockholders and directors meeting on May 5, 1930. Operating reports of the company for the past year were heartily approved and endorsed. Construction plans were discussed for the current year and the following officers were elected:

Directors: G. S. Herbert, C. B. Miller, Ralph Van Trine, Chas. N. Jacobs, Cameron L. Baer, W. J. Lescure, C. L. Brown, Fred Coulson, Karl B. Rugh.

Officers: Chairman of Board, W. J. Lescure; president, C. L. Brown; executive vice-president, Ralph Van Trine; vice-president, Karl B. Rugh; vice-president, Charles N. Jacobs; vice-president, G. S. Herbert; secretary, Henry W. Rasher; assistant secretary, M. C. Beamer; assistant secretary, Cameron L. Baer; treasurer, H. W. Rohrer; assistant treasurer, Henry W. Rasher; assistant treasurer, Cameron L. Baer.

BELVIDERE, S. D.—The exchange of the Farmers Telephone Co. here has a new owner, L. A. Osborn having concluded negotiations for its purchase. He already has assumed control. The new owner plans moving the exchange to another location.

HARPER, TEXAS—In a deal recently consumated, the Kerrville Telephone Co. became the owner of the Harper Telephone Co. The town's major telephone system has been owned and operated by the Kerrville Telephone Co. for the past 20 years or more and the absorption of the other local company gives it the complete ownership of the field.

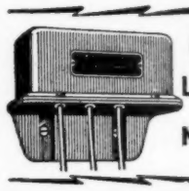
Since taking over the locally-owned company the Kerrville Telephone Co. is planning a first-class metallic line connecting Harper and Fredericksburg. Two years ago it installed a complete and modern cable system in Harper and a new switchboard.

We will sell your
Telephone Directory ADVERTISING
or will publish your directory complete
L. M. BERRY & CO. DAYTON, OHIO

Western Telephone Directory Co.
A Telephone Directory Advertising Sales Organization
Main Office: Telephone Bldg., Kansas City, Mo.
Wichita, Kan. 816 Brown Bldg.
Chicago 100 W. Monroe

ACCOUNTING
HERDRICH AND BOGGS
Certified Public Accountants
Specializing on Public Utilities
901-7 Continental Bank Bldg.
Indianapolis, Indiana

Universal Insulators
will support your drop wires to your entire satisfaction and at a minimum cost. Are you a user? Samples free on request.
Universal Specialty Co.
711 Poplar Street
Terre Haute, Ind.


CHAPMAN
LIGHTNING ARRESTERS
MADE BY
MINNESOTA ELECTRIC CO.
MINNEAPOLIS, MINN.

Republic Appraisal Company, Inc.
Seaborn N. Vines, Pres.
John C. Larkin, Vice-Pres.
Specialists in valuation, engineering, management and accounting for telephone properties.
General Offices:
Chamber of Commerce Bldg.
Syracuse, N. Y.

NILCO
SWITCHBOARD LAMPS
NILCO LAMP WORKS, INC., Emporium, Pennsylvania

Creosoted
CEDAR POLES
Prompt Shipment via Rail or Water
CASCADE TIMBER CO.
822 Tacoma Building Tacoma, Wash.

NAUGLE POLES
Northern and Western Cedar
Butt-treated or Plain
NAUGLE POLE & TIE CO.
59 East Madison St., Chicago

THE BOWDLE SYSTEM
Always shows you where you stand. We have solved the bookkeeping problem of a large number of companies.
Write us about our monthly audit.
Bowdle Accounting Systems
Cerro Gordo, Illinois